WEATHER 101
THE TROPICS

JESSIE SMITH | METEOROLOGIST

National Weather Service – Melbourne, FL

Jessica.r.smith@noaa.gov

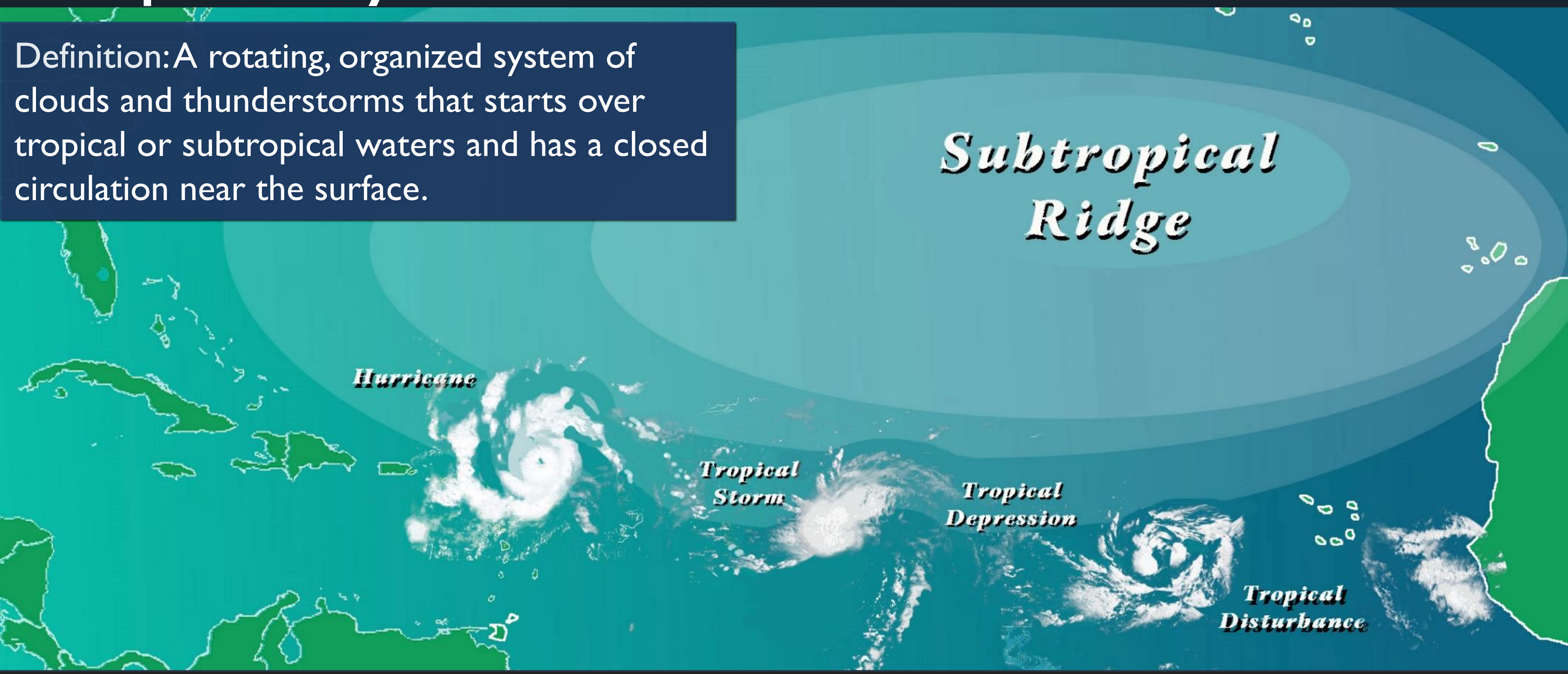
Today's Agenda

- Tropical Cyclone Basics
- Saffir-Simpson Wind Scale
- 2016-2020 Hurricane Seasons
- The 4 Hazards
- Seasonal Forecasting & Collecting Data
- National Hurricane Center Products

Tropical Cyclone Basics

Tropical Cyclones

Definition: A rotating, organized system of clouds and thunderstorms that starts over tropical or subtropical waters and has a closed circulation near the surface.



Storm Strength Classifications

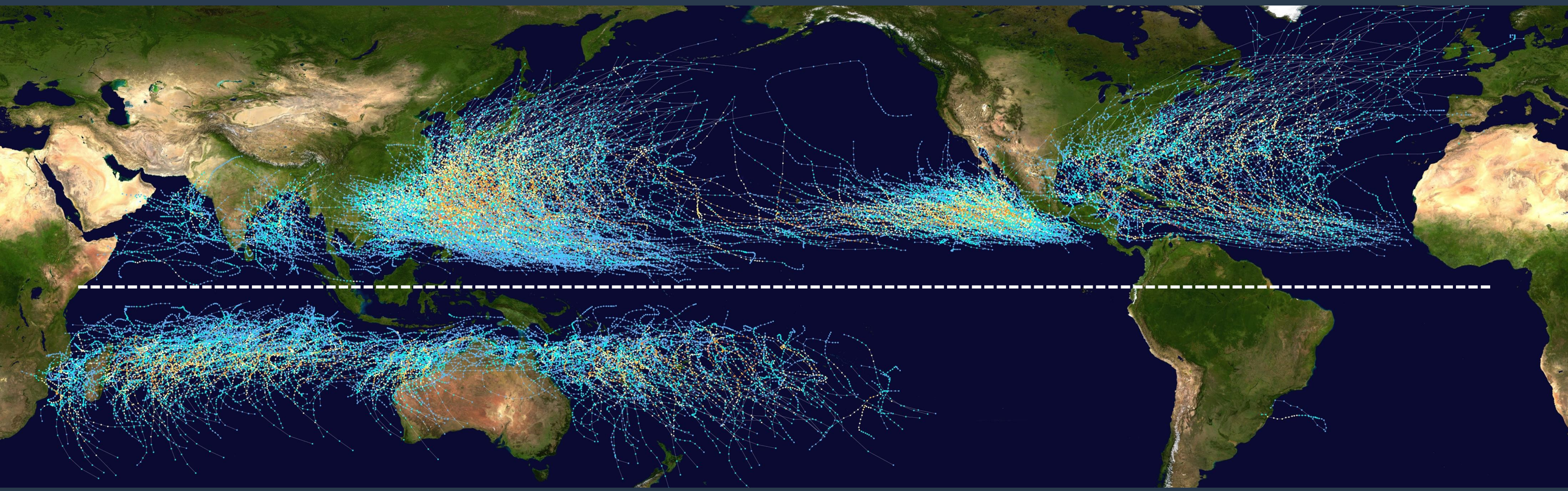
TD	TS	CAT 1	CAT 2	MAJOR CAT 3	MAJOR CAT 4	MAJOR CAT 5
< 39 MPH *< 63 KM/H*	39-73 MPH *63-118 KM/H*	74-95 MPH *119-153 KM/H*	96-110 MPH *154-177 KM/H*	111-129 MPH *178-208 KM/H*	130-156 MPH *209-251 KM/H*	157+ MPH *252+ KM/H*

Sources: Storm data provided by the National Hurricane Center, a division of the National Weather Service

Tropical Cyclones

INGREDIENTS

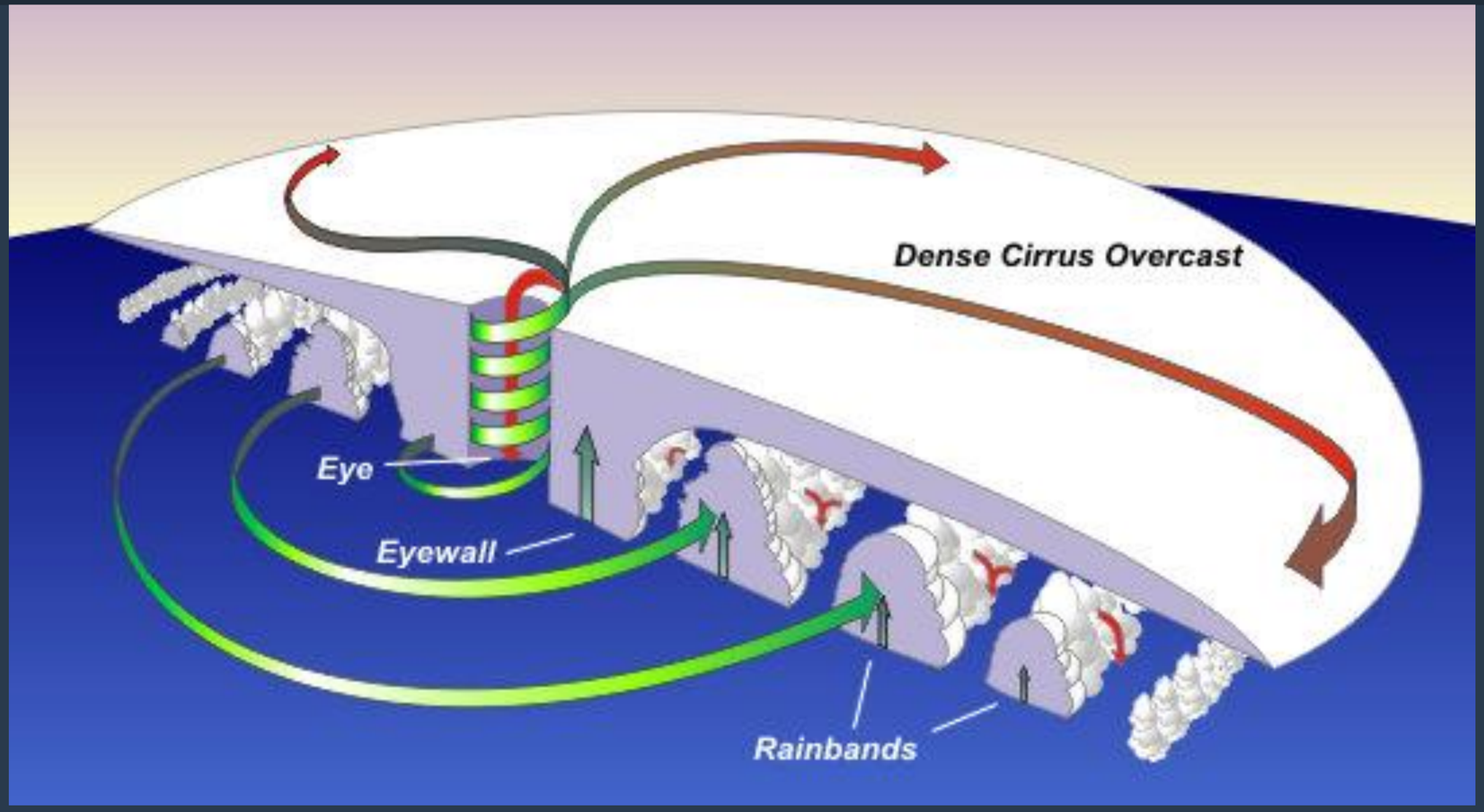
- Warm ocean water through a deep layer
- Unstable atmosphere with sufficient moisture
- Low vertical wind shear
- Pre-existing disturbance near the surface (away from equator)

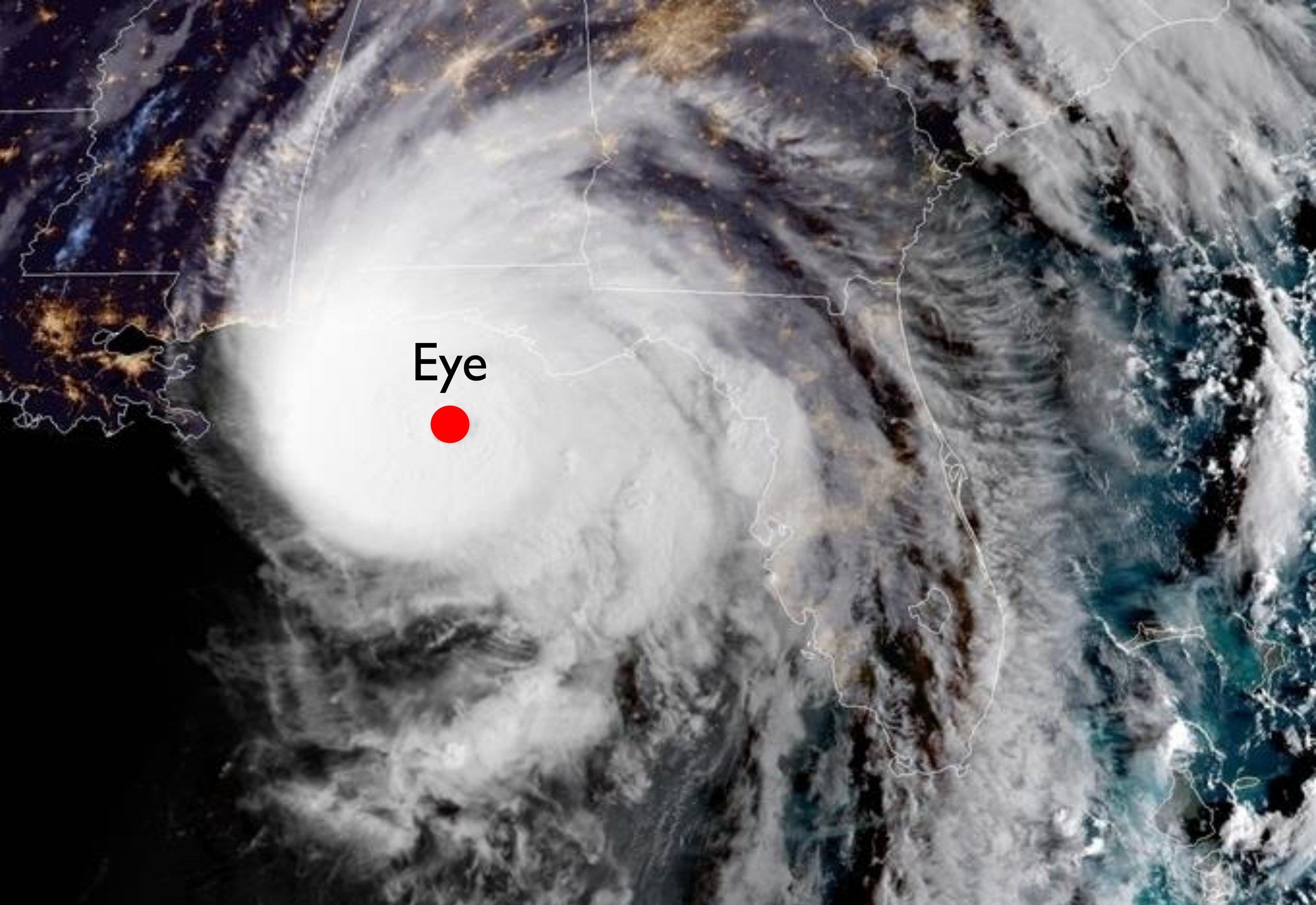


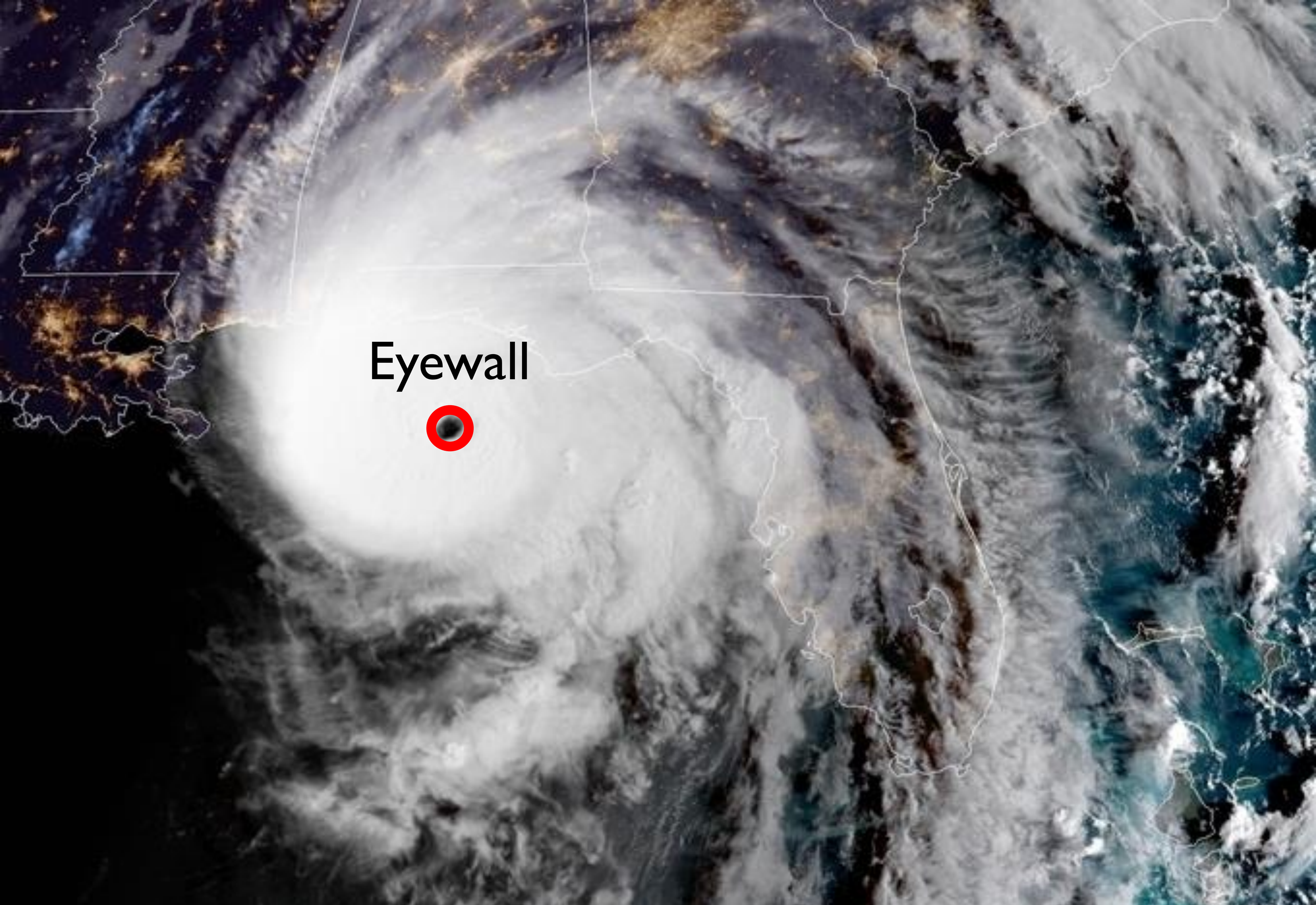
Tropical Cyclones

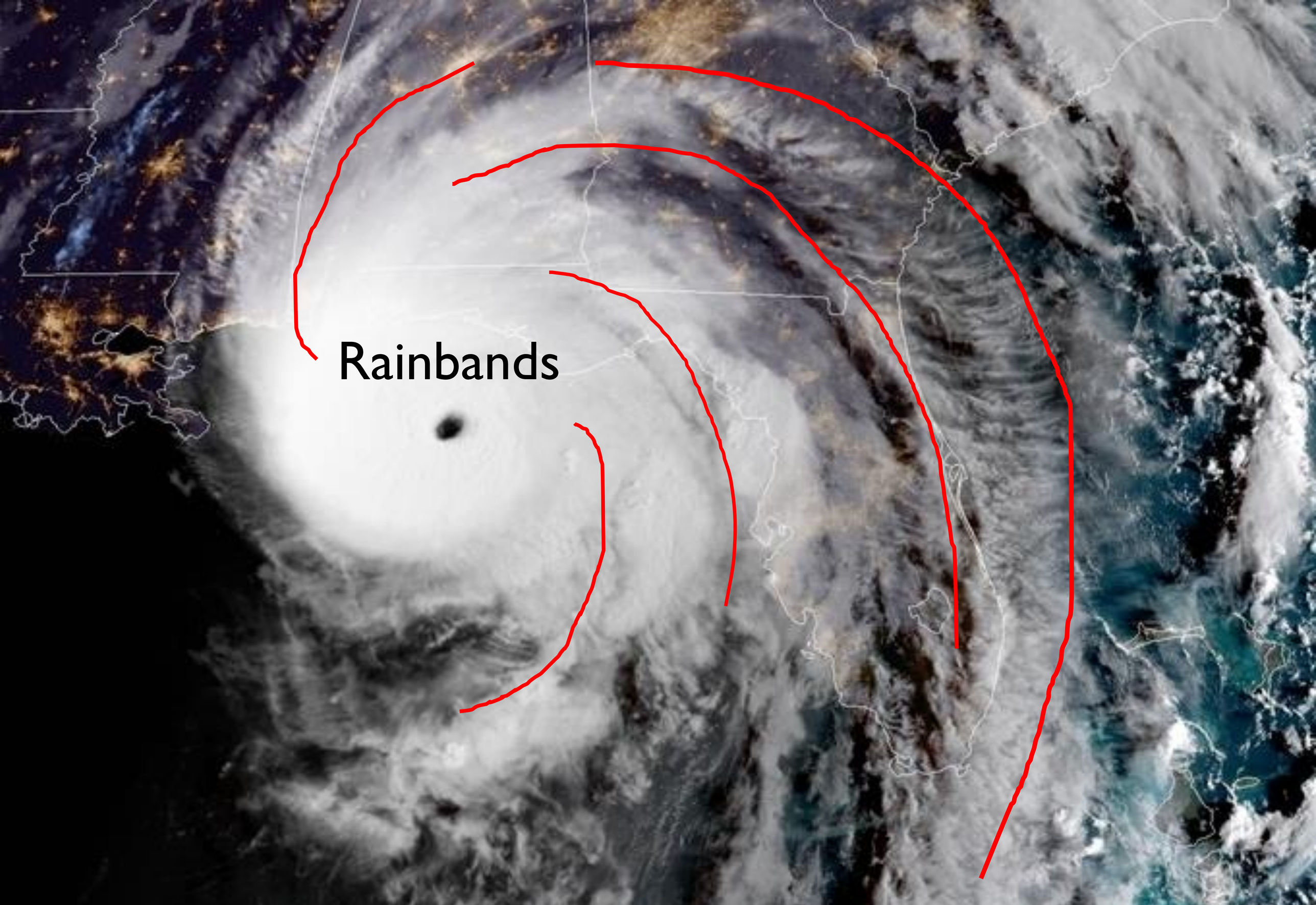
STRUCTURE

- **Eye:** center of the storm, relatively calm & sinking air
- **Eyewall:** strongest winds located here; indicates storm intensity
- **Rainbands:** curved bands of heavy rain that spiral away from the eyewall; tornados possible




Eye

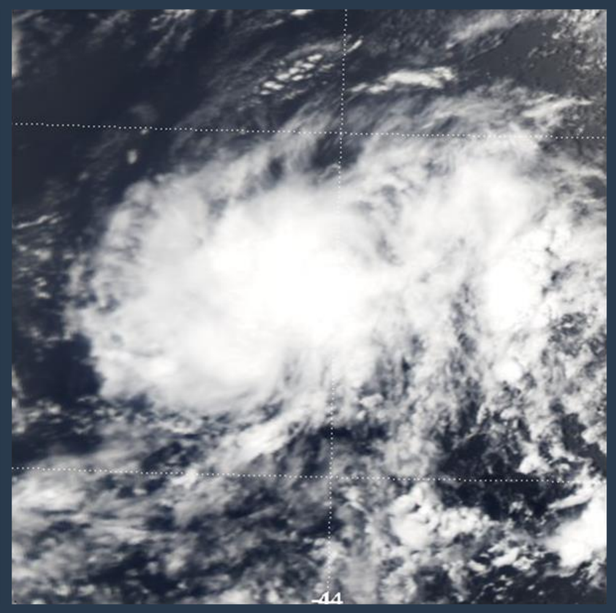

Eyewall


Rainbands

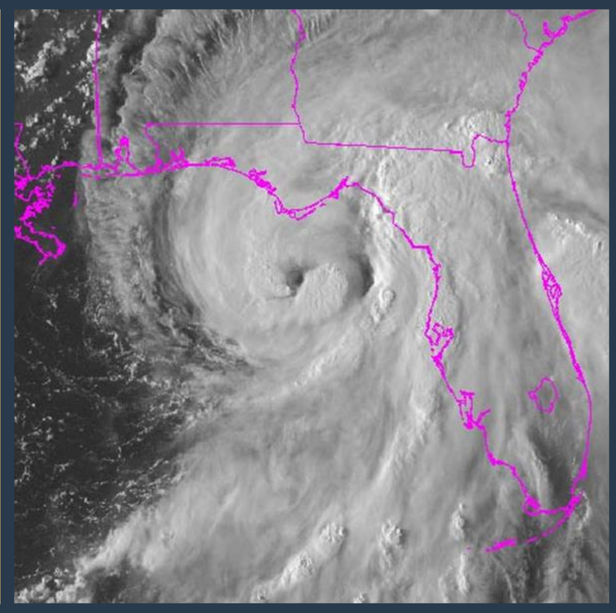
Tropical Cyclones

Tropical Cyclone Come in All Shapes & Sizes!

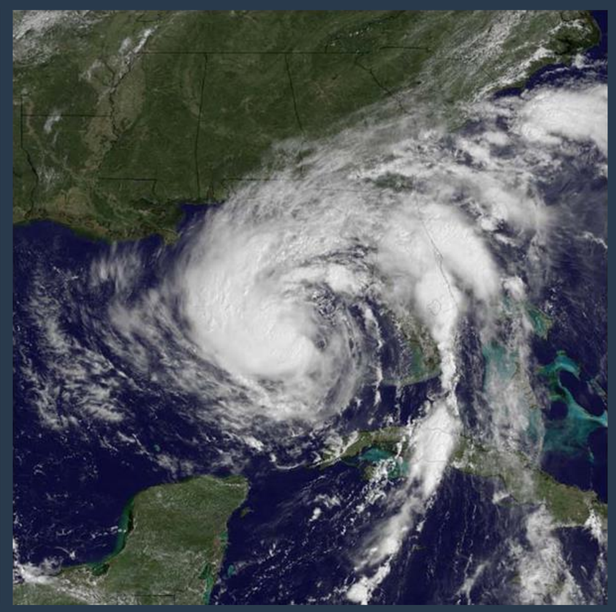
Tropical Depression (winds at or below 38 mph)



Hurricane (winds at or above 74 mph)



Tropical Storm (winds between 39 – 73 mph)



Major Hurricane (winds at or above 111 mph)

Tropical Cyclones

Saffir-Simpson Hurricane Wind Scale

Category 1 - 5

5
WIND: 157 mph or higher
DAMAGE: Catastropic damage will occur

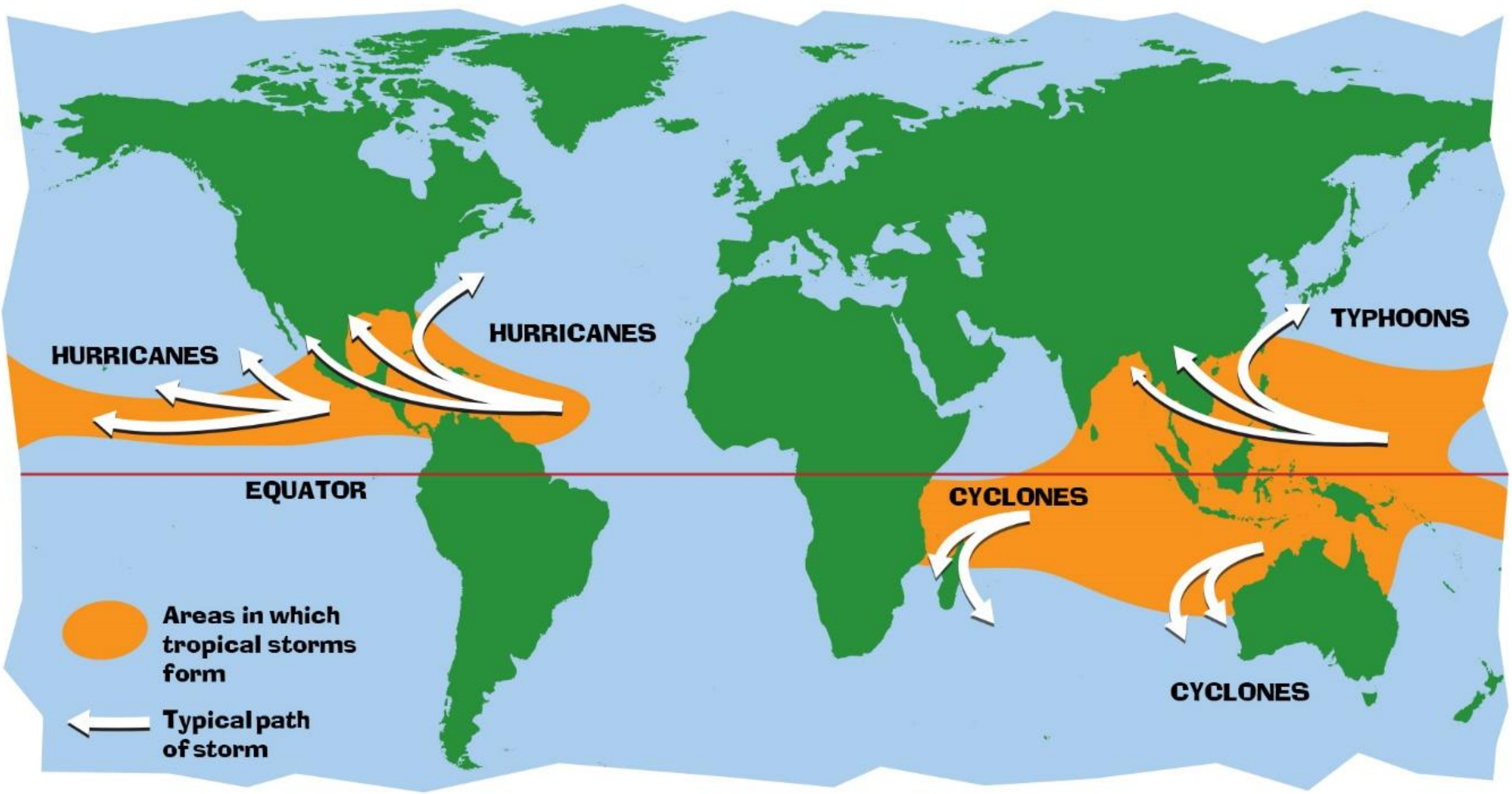
4
WIND: 130-156 mph
DAMAGE: Catastropic damage will occur

3
WIND: 111-129 mph
DAMAGE: Devastating damage will occur

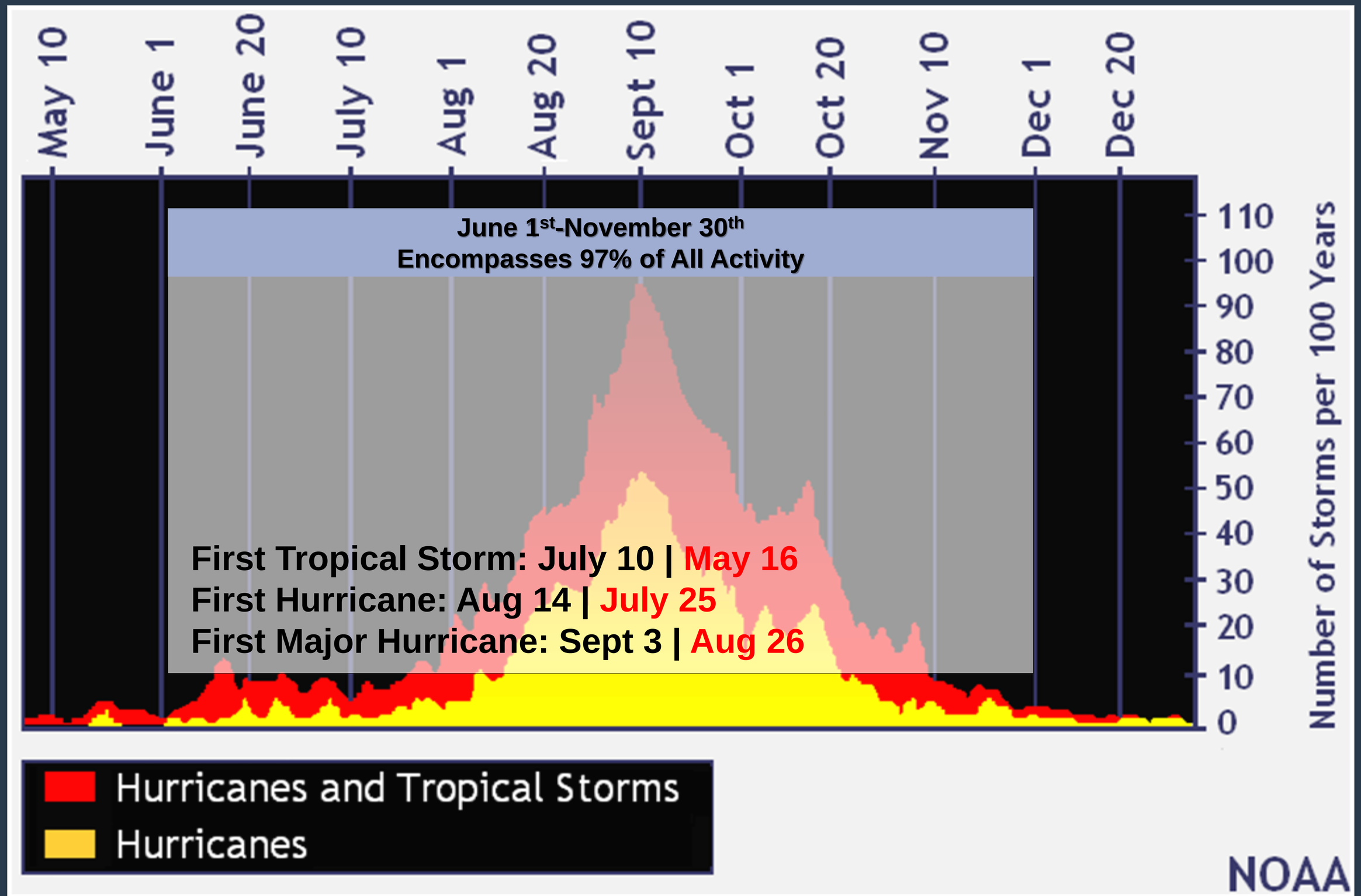
2
WIND: 96-110 mph
DAMAGE: Extremely dangerous winds will cause extensive damage

1
WIND: 74-95 mph
DAMAGE: Very dangerous winds will produce some damage

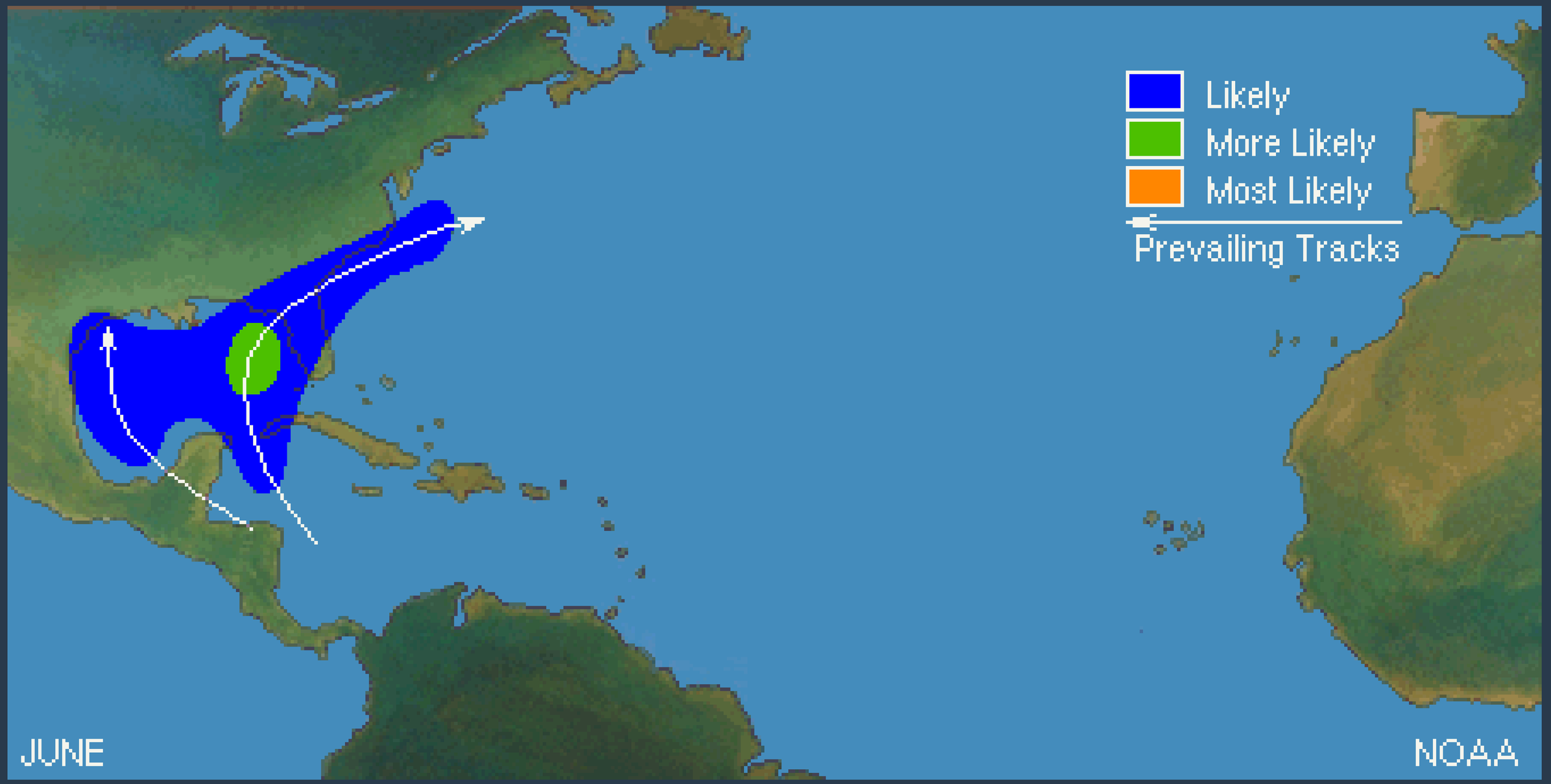
Tropical Cyclones



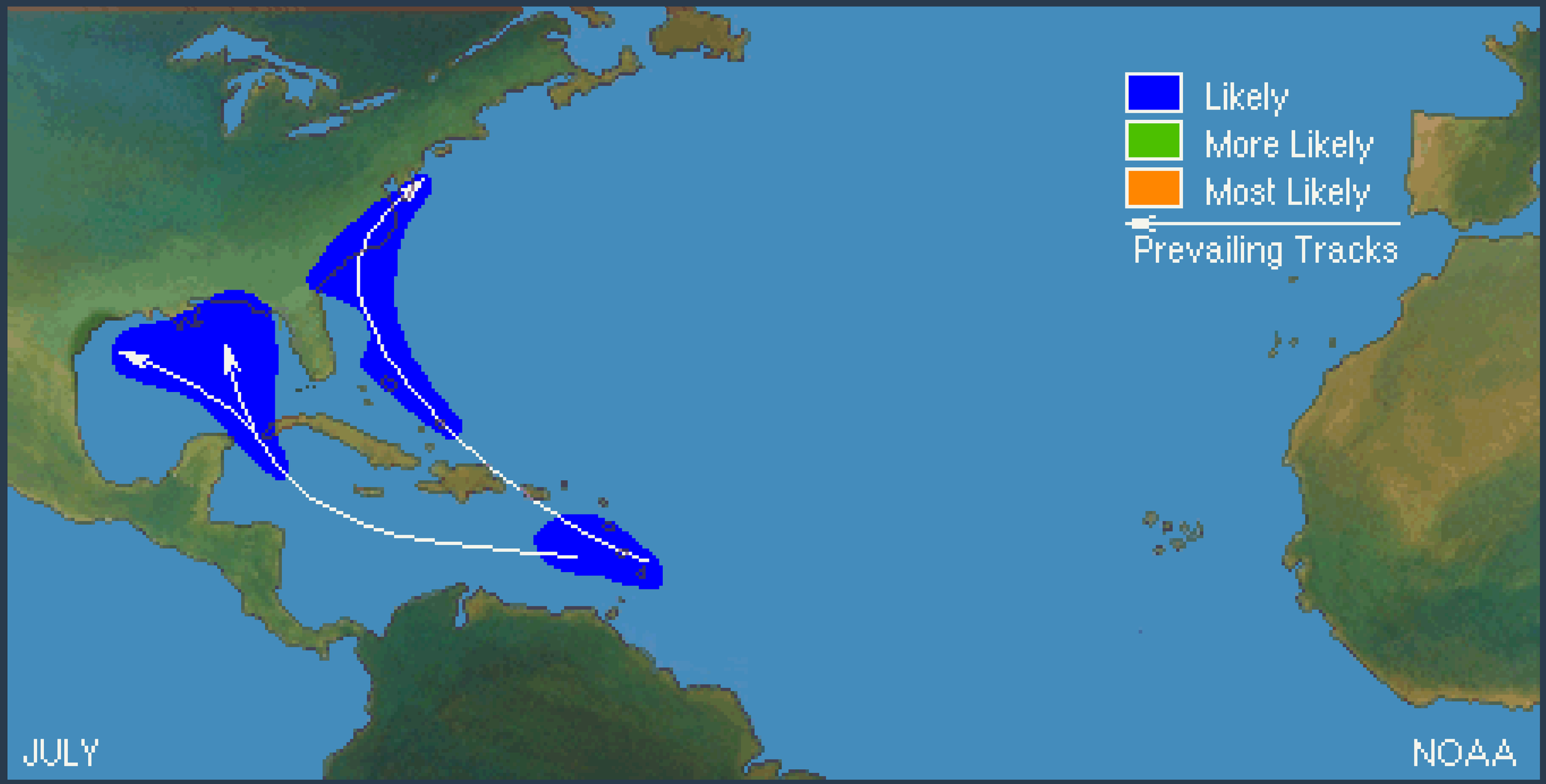
Tropical Cyclones



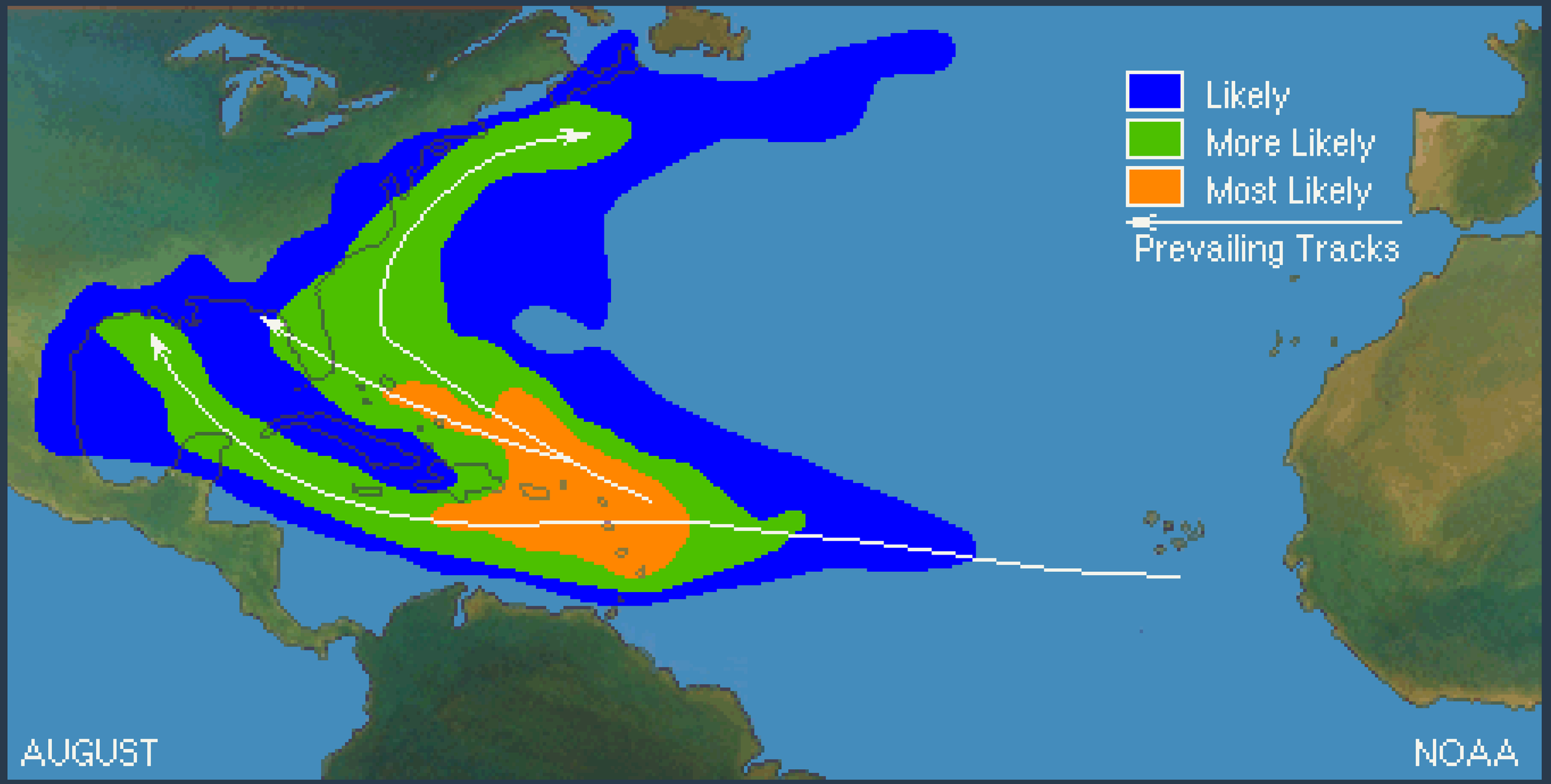
Tropical Cyclones



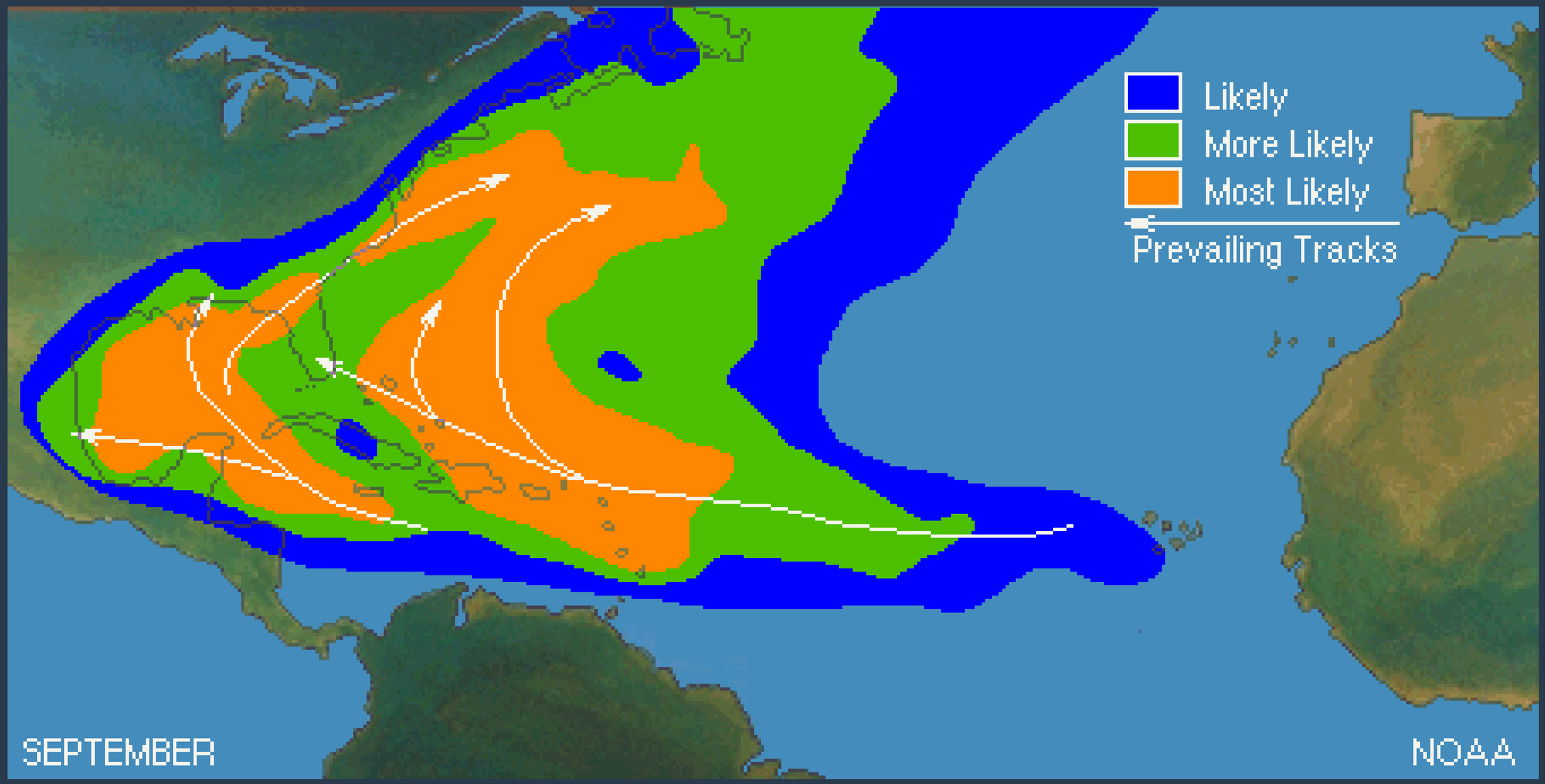
Tropical Cyclones



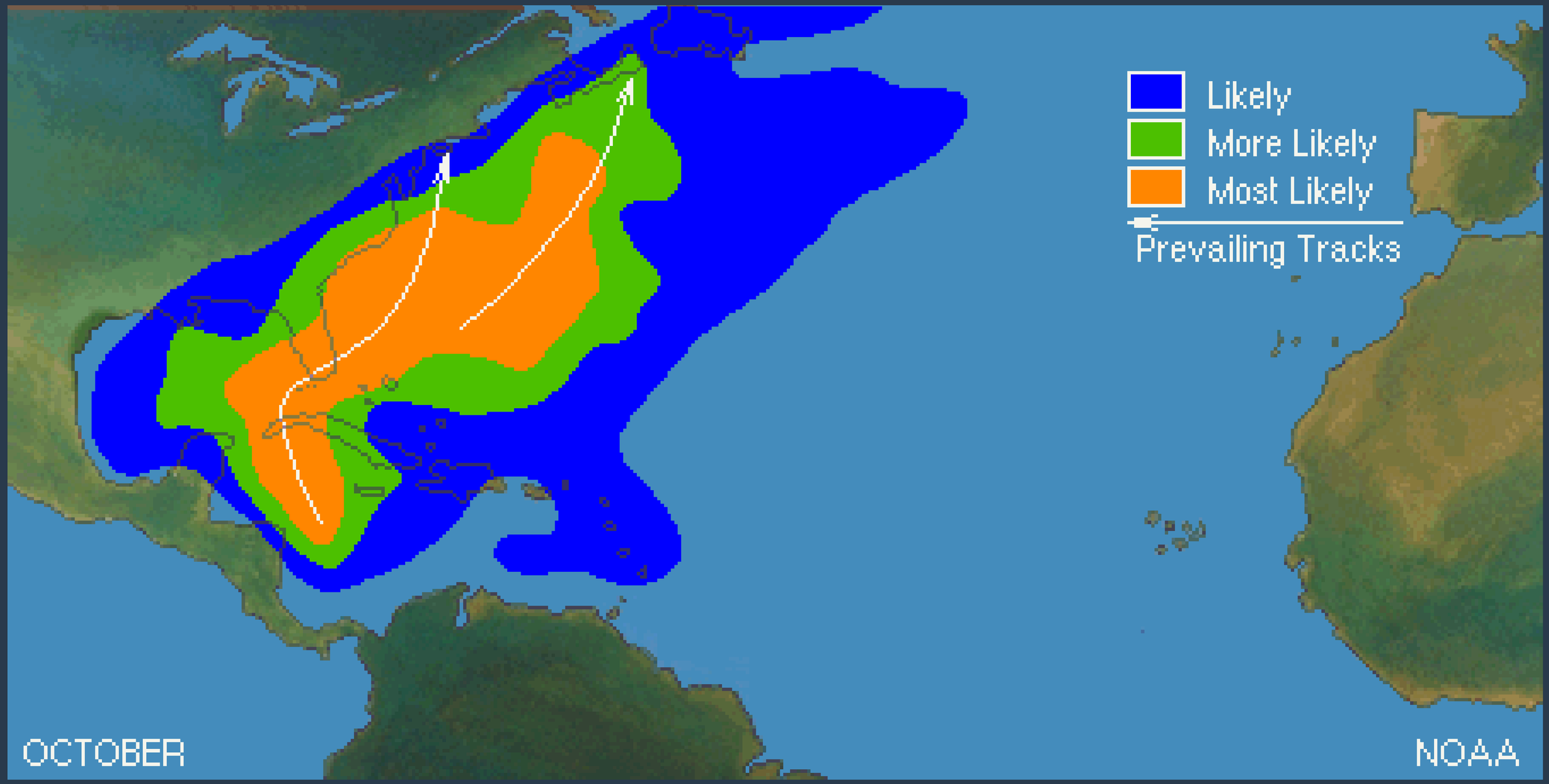
Tropical Cyclones



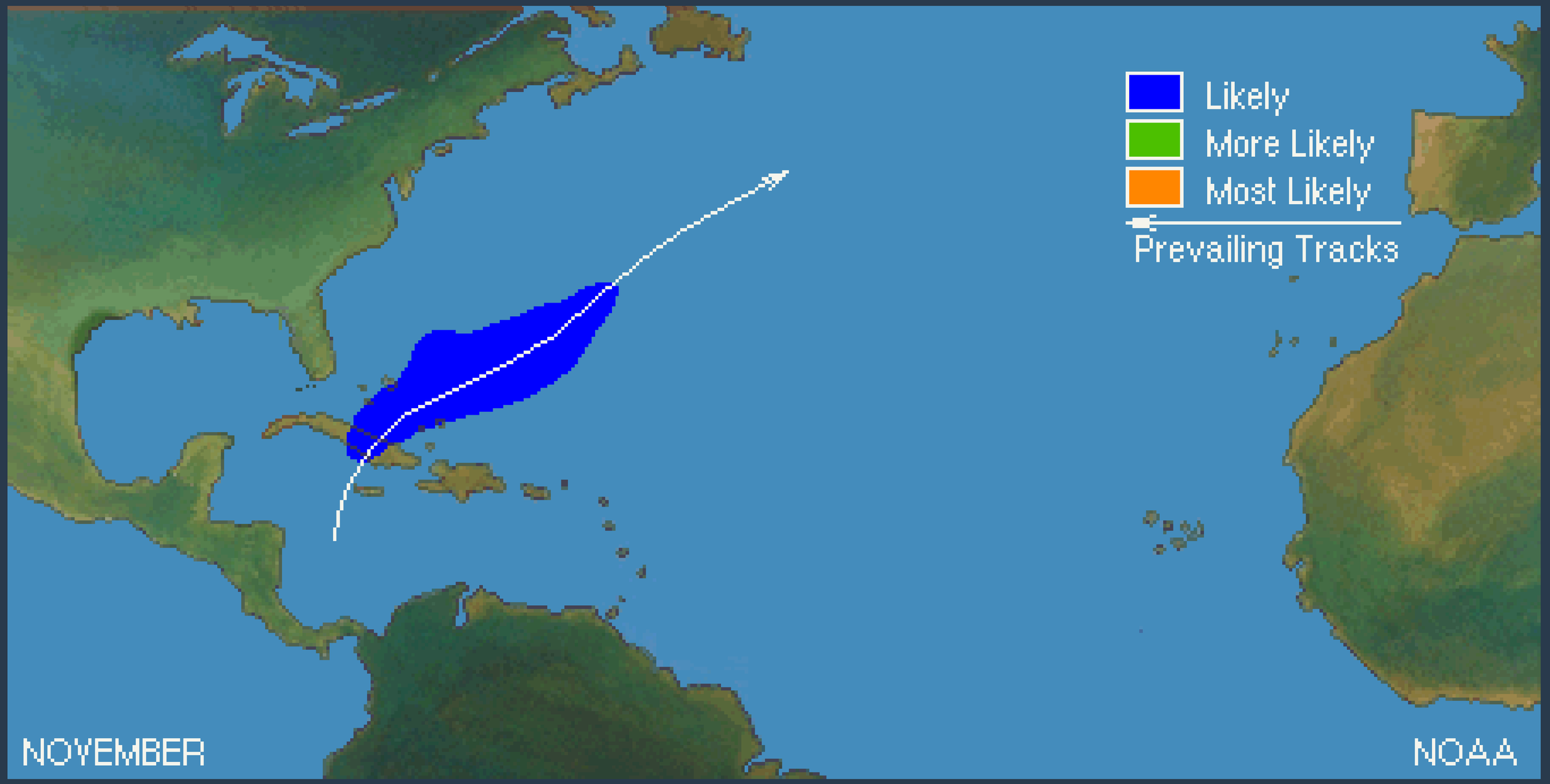
Tropical Cyclones



Tropical Cyclones



Tropical Cyclones



Pop Quiz!

Where are the strongest winds in a hurricane located?

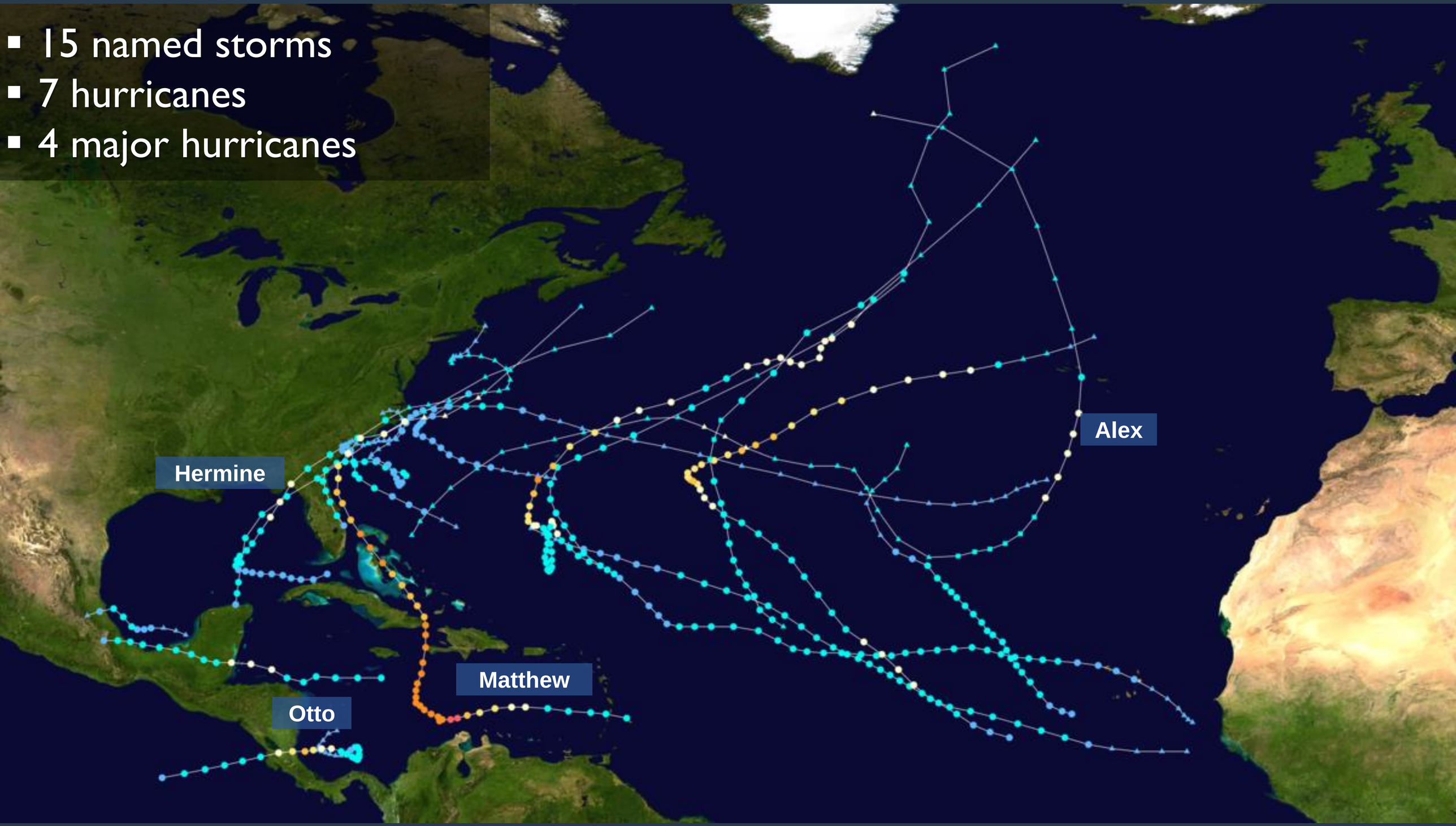
NWS Nashville Presents

Weather101

5 Year Season Summary

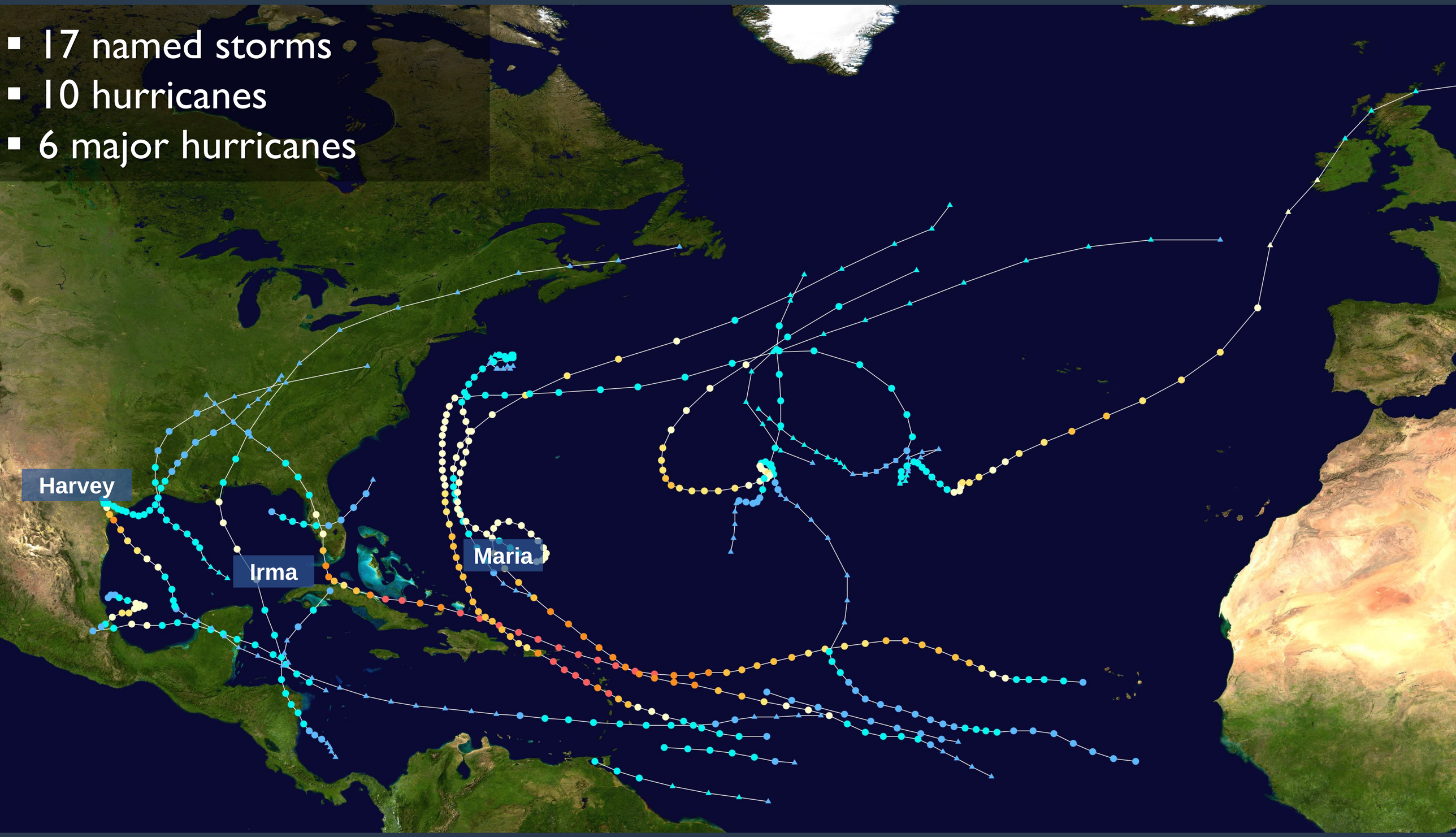
2016 Hurricane Season

- 15 named storms
- 7 hurricanes
- 4 major hurricanes



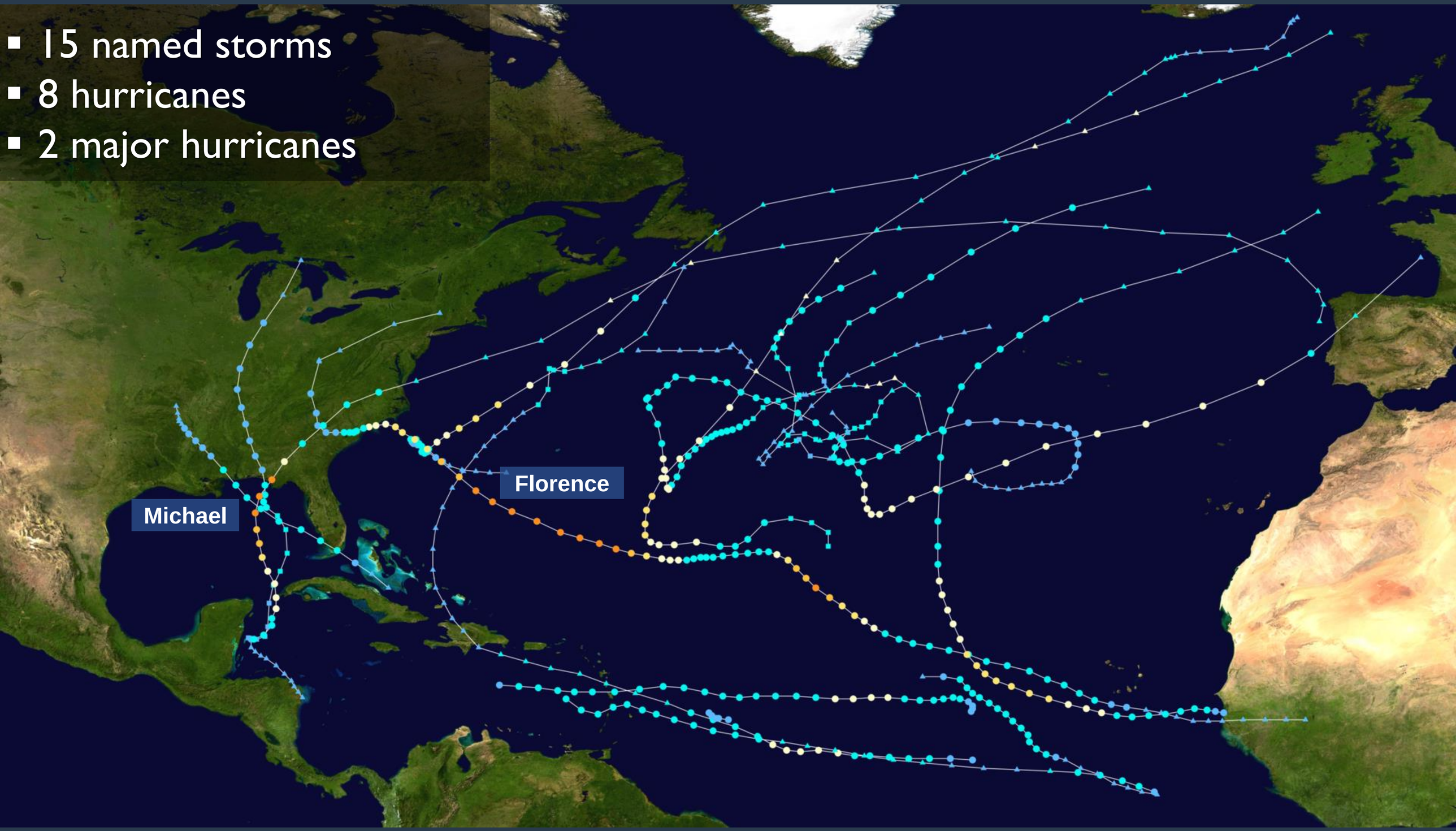
2017 Hurricane Season

- 17 named storms
- 10 hurricanes
- 6 major hurricanes



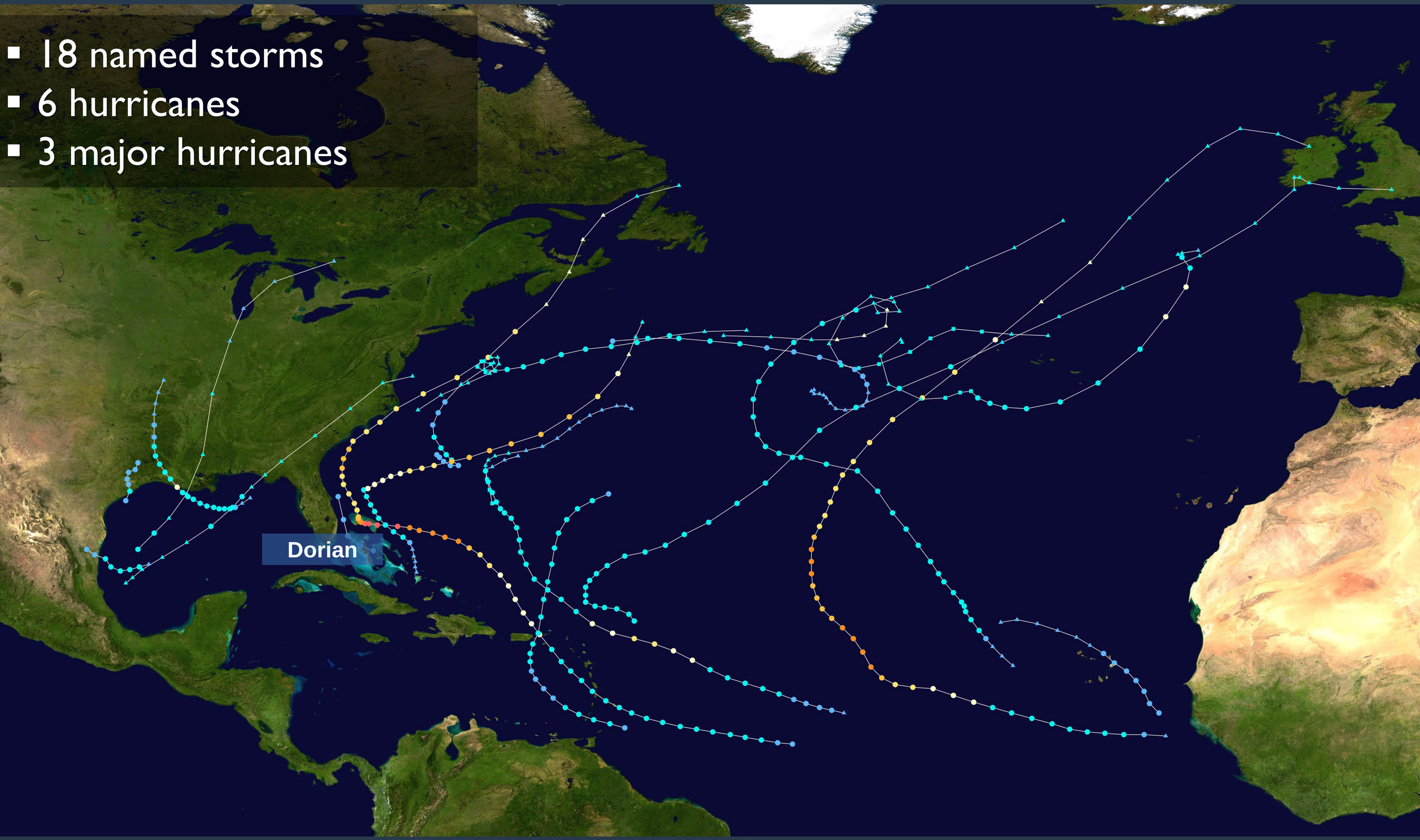
2018 Hurricane Season

- 15 named storms
- 8 hurricanes
- 2 major hurricanes

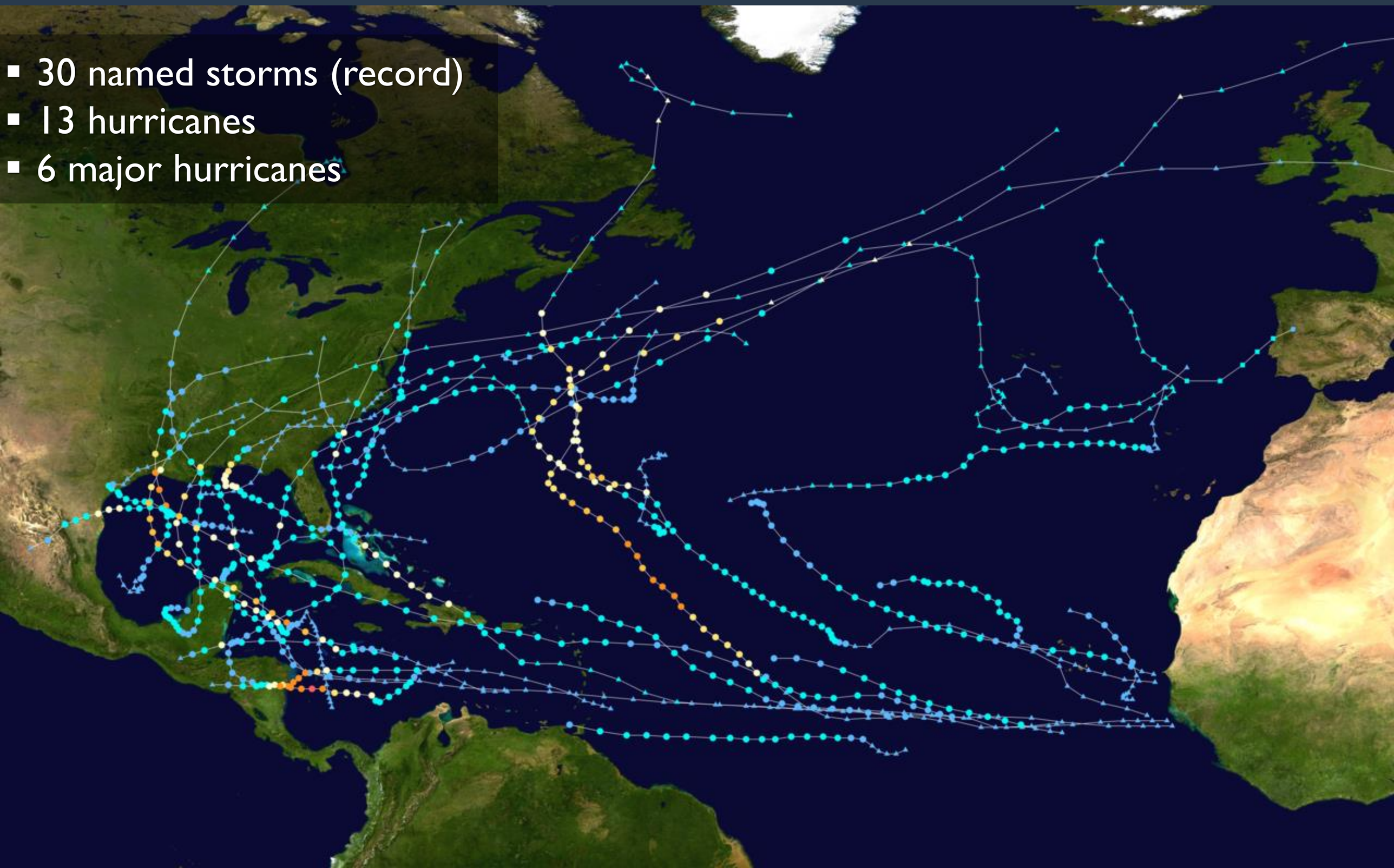


2019 Hurricane Season

- 18 named storms
- 6 hurricanes
- 3 major hurricanes



2020 Hurricane Season



- 30 named storms (record)
- 13 hurricanes
- 6 major hurricanes

2020 Hurricane Season Names

2020 Atlantic Tropical Cyclone Names*

~~Arthur~~	Hanna	Omar
Bertha	Isaias	Paulette
Cristobal	Josephine	Rene
Dolly	Kyle	Sally
Edouard	Laura	Teddy
Fay	Marco	Vicky
Gonzalo	Nana	Wilfred

*Names provided by the World Meteorological Organization

Be prepared: Visit hurricanes.gov and follow @NWS and @NHC_Atlantic on Twitter.

May 2020

2020 Hurricane Season Names

Alpha Beta Gamma Delta Epsilon Zeta

2005 Made it Here

Eta Theta Iota Kappa Lambda Mu

Nu Xi Omicron Pi Rho Sigma

Tau Upsilon Phi Chi Psi Omega

Hurricane Hazards

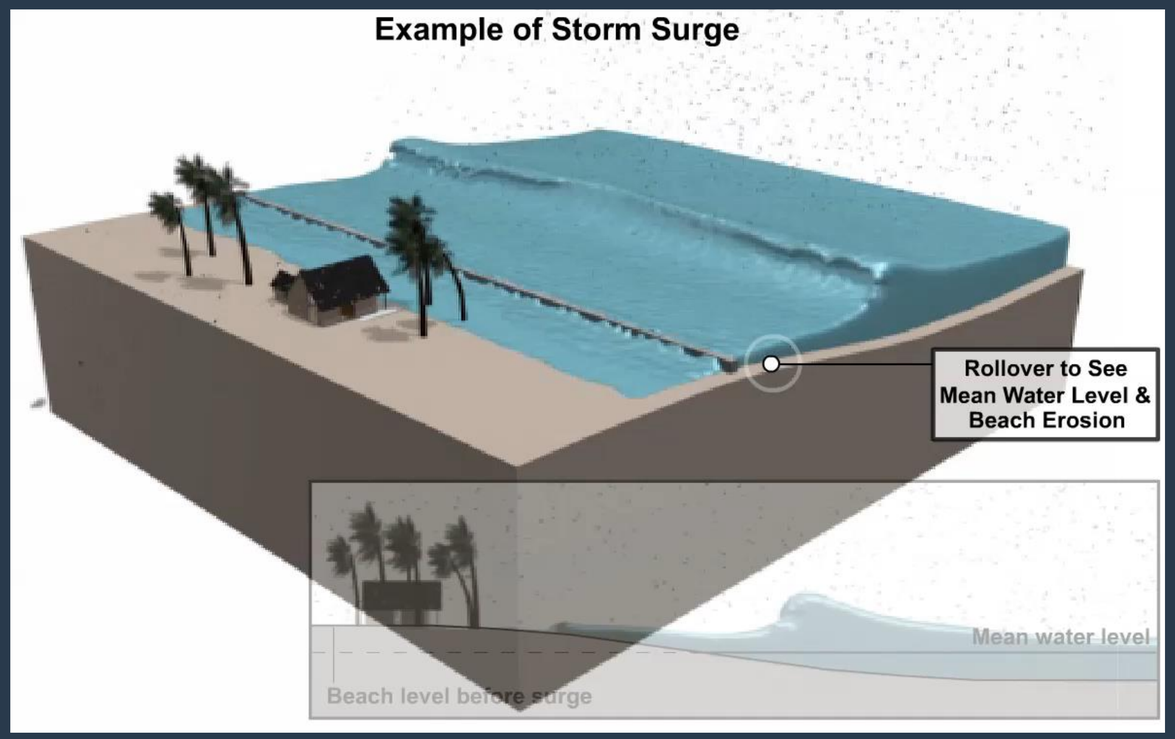
Hurricane Hazards

Hurricane Hazards

- Strongest winds near the center of the storm
- Causes dangerous flying debris

- Strong Winds
- Storm Surge
- Flooding
- Tornadoes

Hurricane Hazards



- Rise of water due to a storm
- Most dangerous to people!

- Strong Winds
- Storm Surge
- Flooding
- Tornadoes

Hurricane Hazards

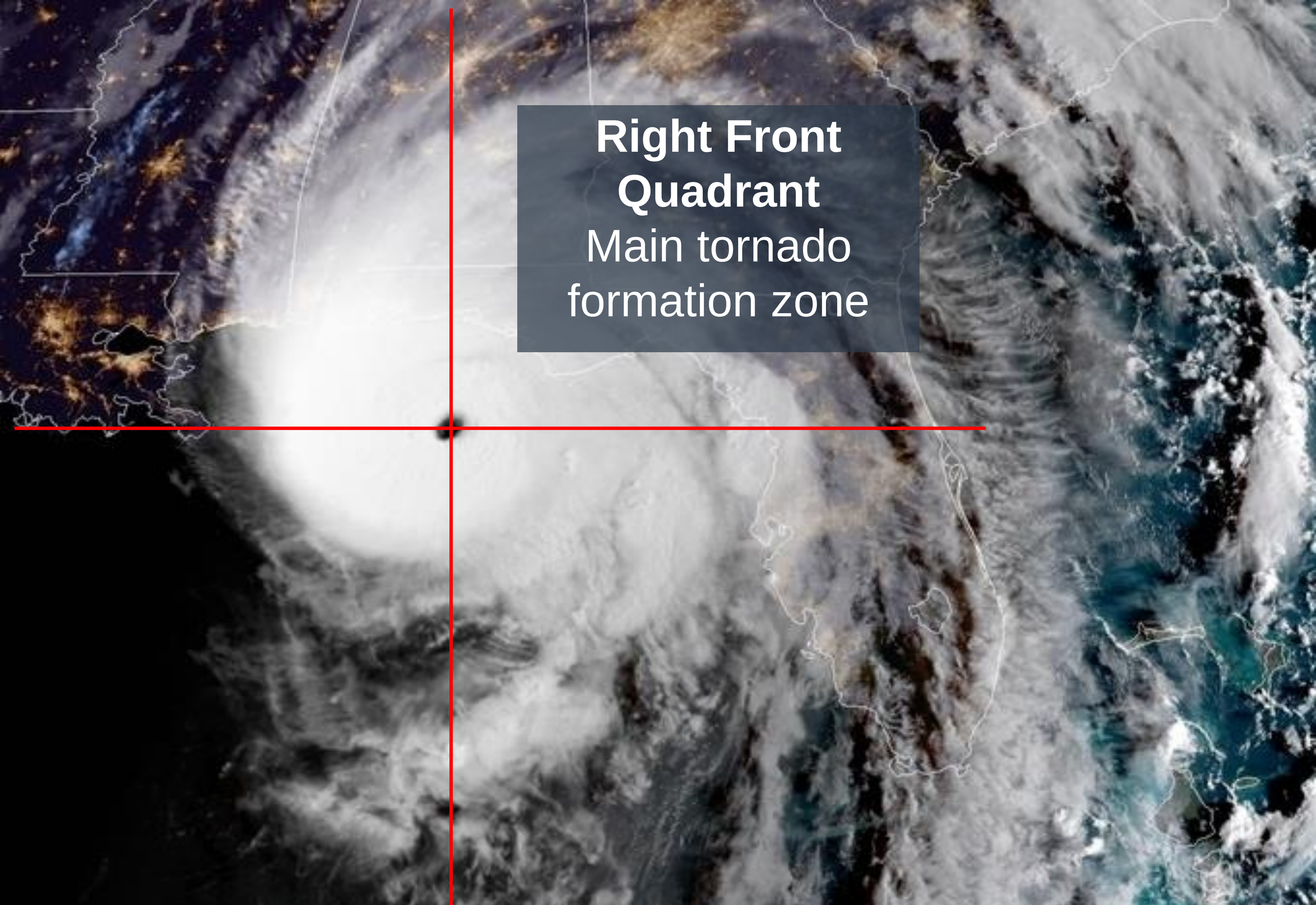

- Heavy rain often leads to flooding
- Can take place no matter how strong a storm is

- Strong Winds
- Storm Surge
- Flooding
- Tornadoes

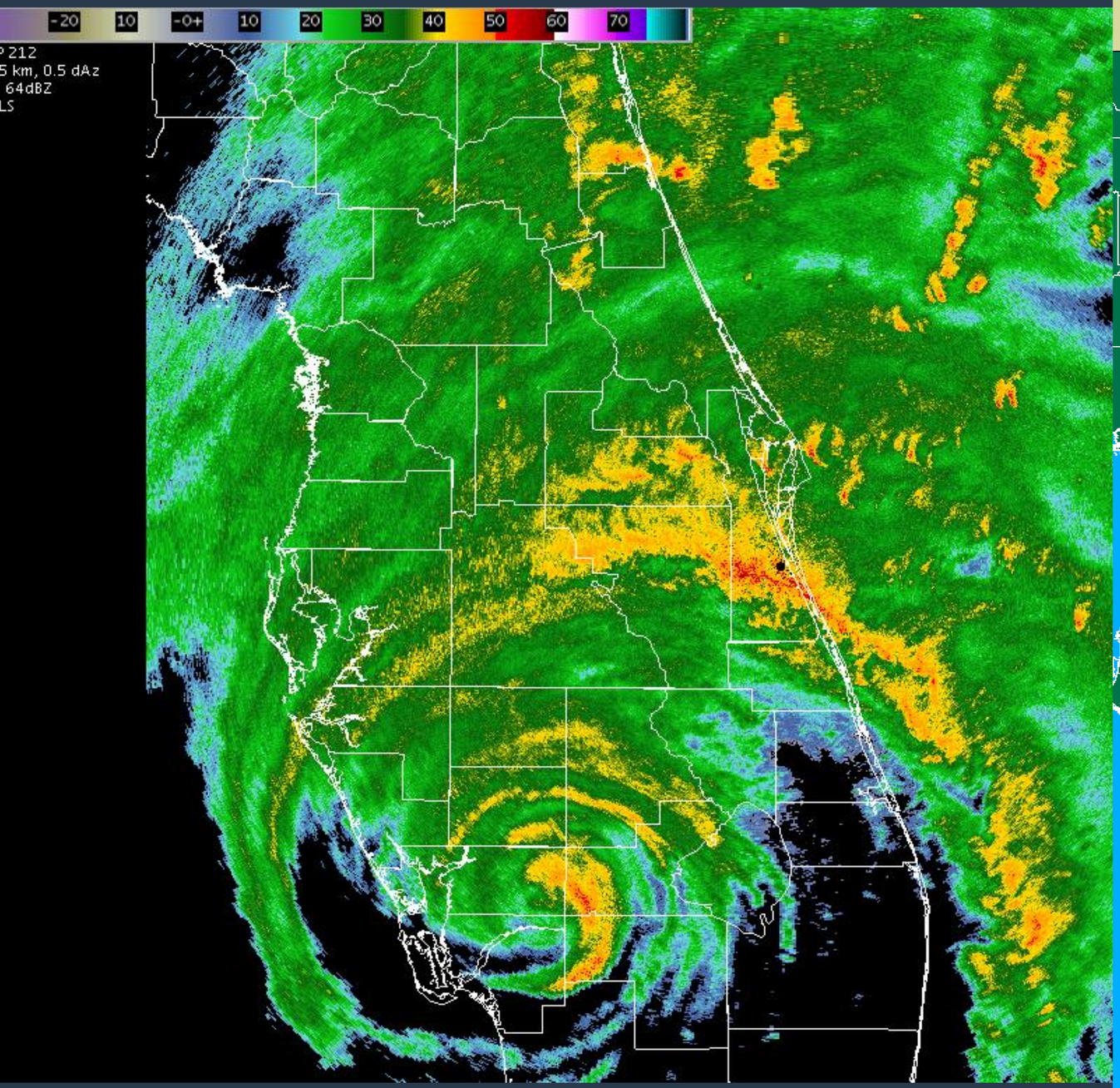
Hurricane Hazards

- Strong Winds
- Storm Surge
- Flooding
- Tornadoes

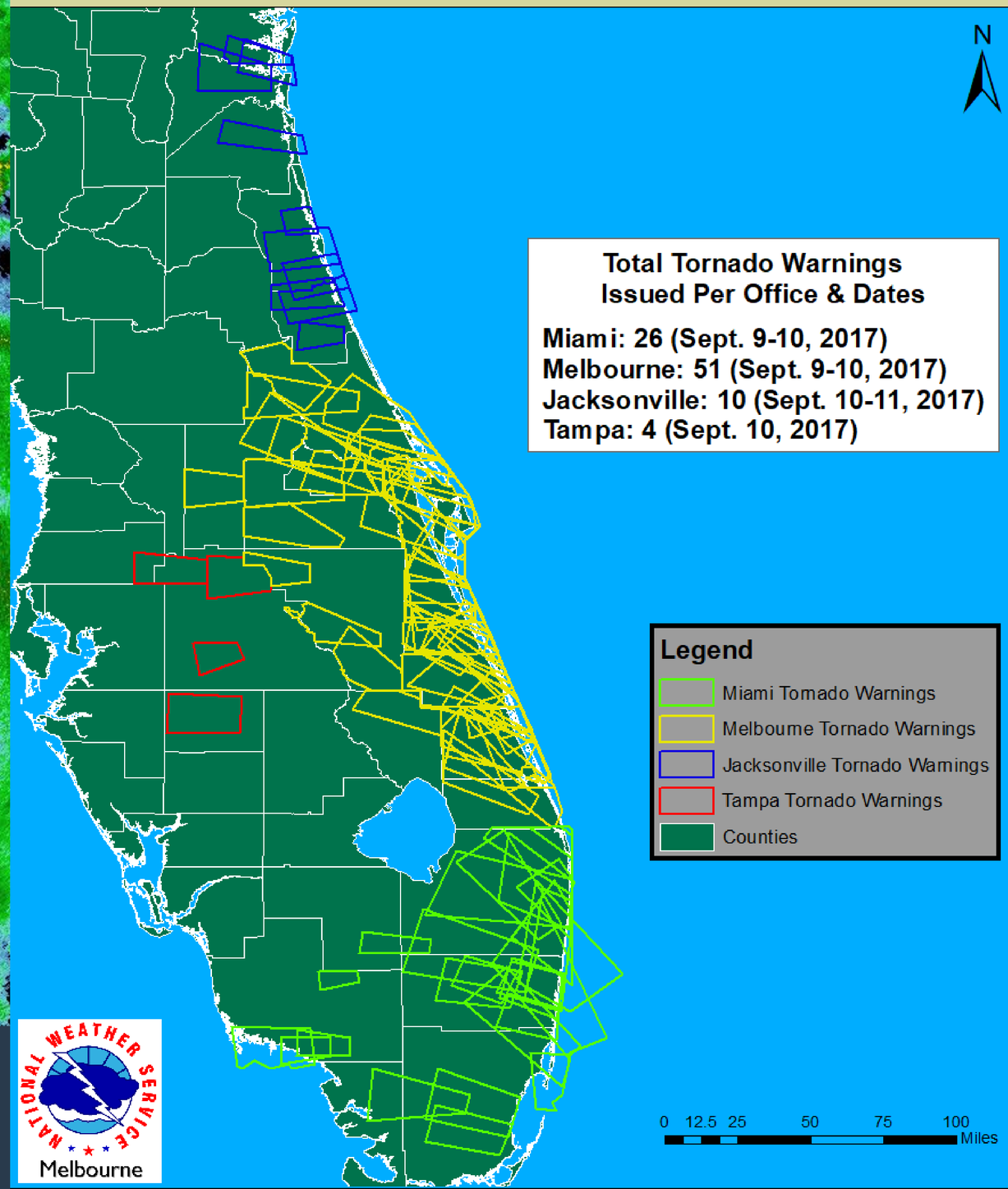
- Often occurs well ahead of a storm!
- Can affect preparation and evacuation activities


Right Front Quadrant
Main tornado formation zone

Hurricane Irma (2017)



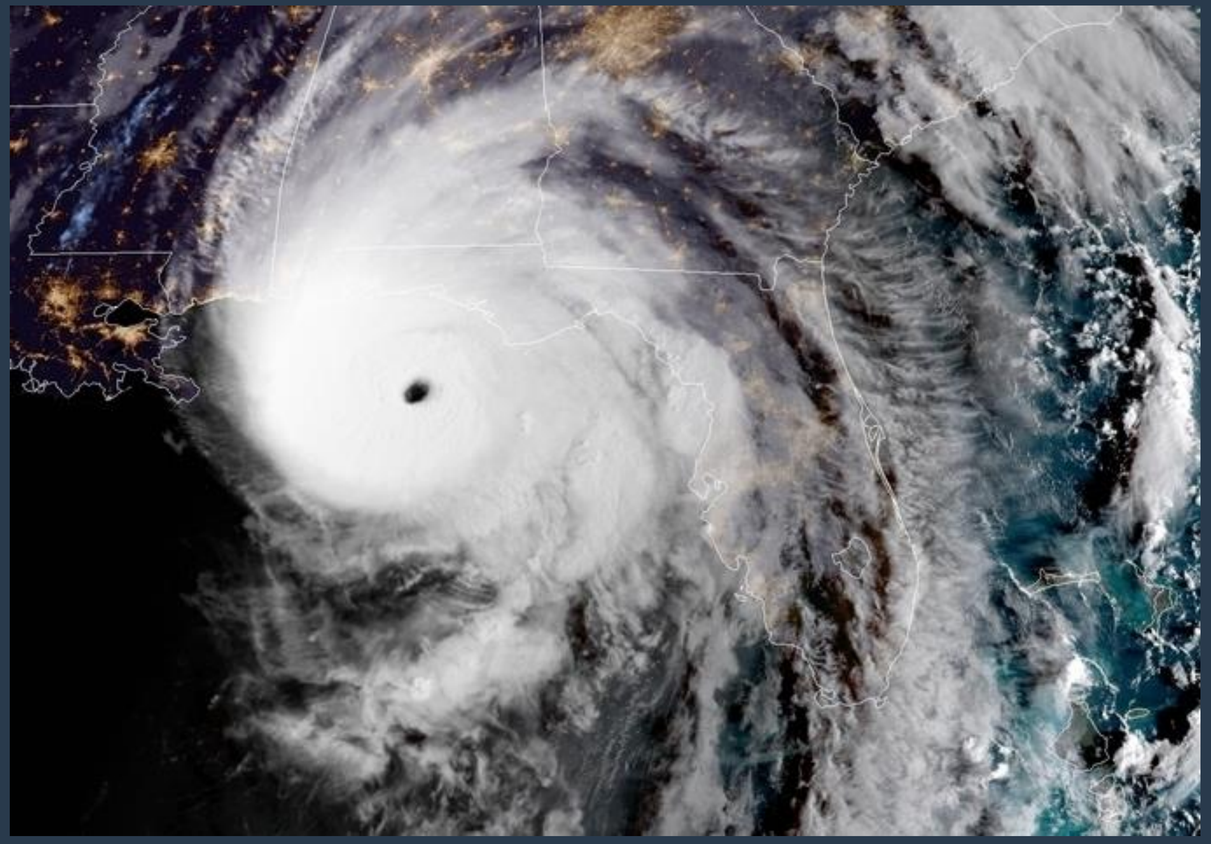
Hurricane Irma Tornado Warnings Issued By Florida Weather Forecast Offices



Debunking the Myth

Hurricanes vs Tornadoes

Wait, they aren't the same?



Debunking the Myth

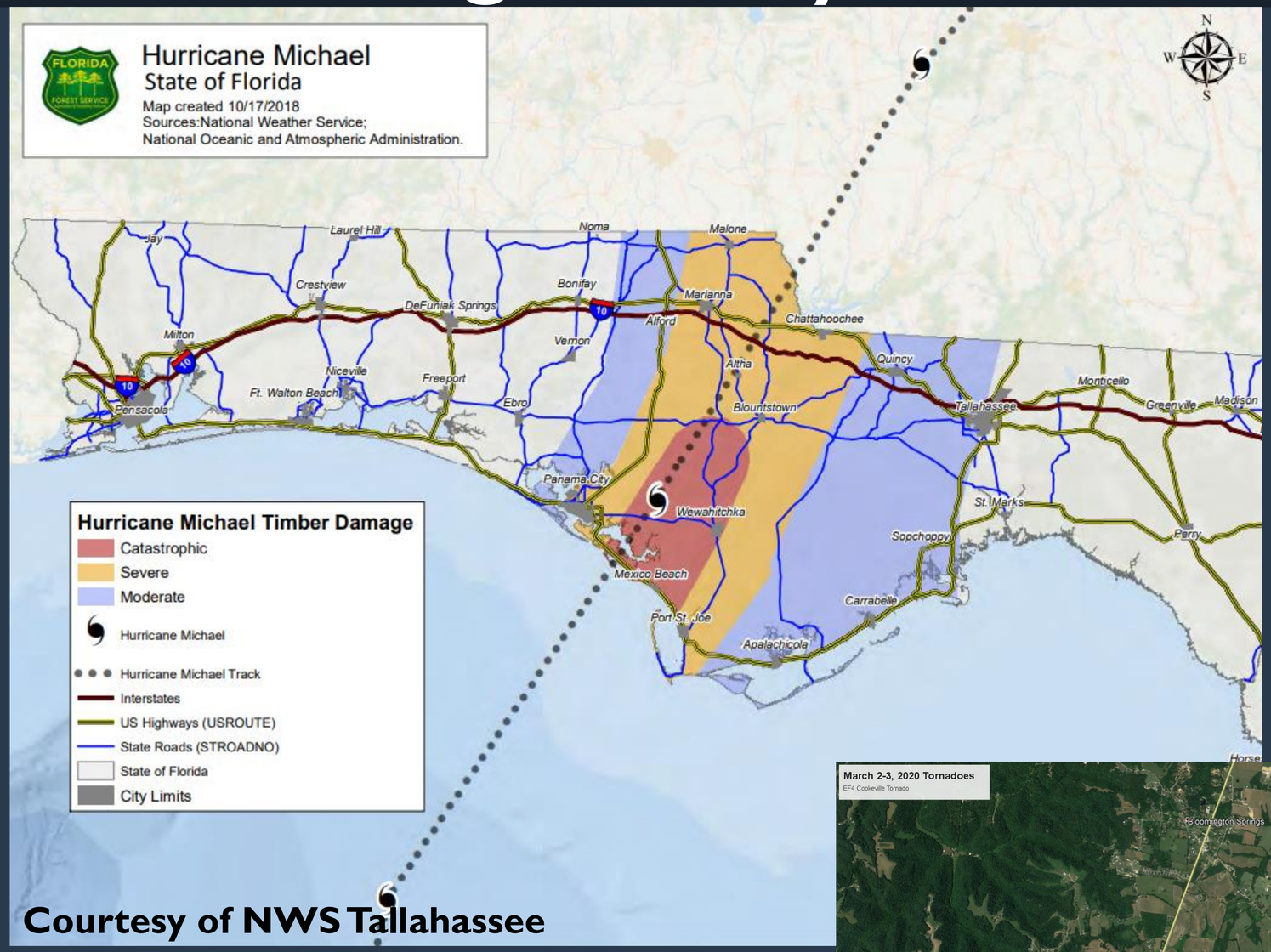
Hurricanes vs Tornadoes

Wait, they aren't the same?

Hurricane Michael Damage
October 2020
Chipley, FL

EF-3 Tornado Damage
March 2020
Nashville, TN

Debunking the Myth

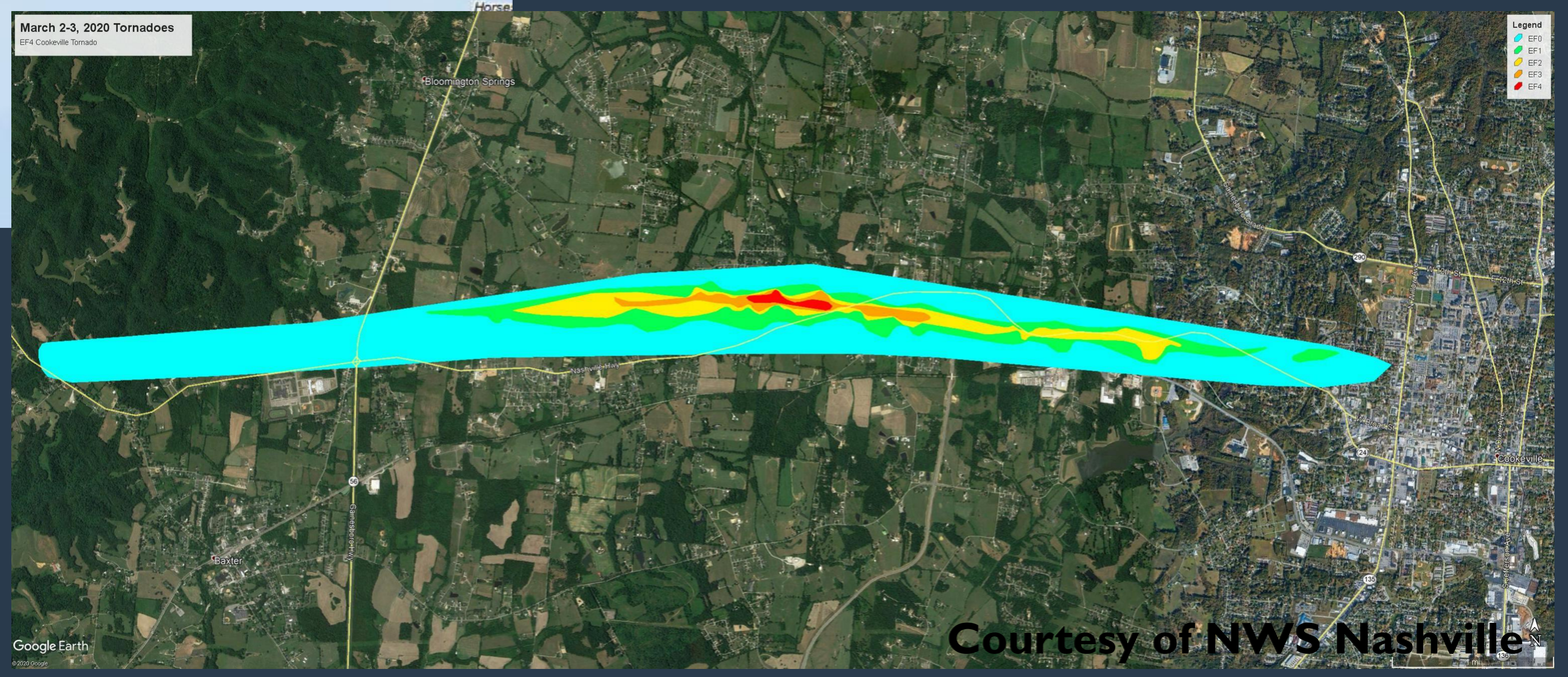


Courtesy of NWS Tallahassee

Hurricane Michael

Max Winds 161 mph

Duration (in FL): 5.5 hours



Courtesy of NWS Nashville

Cookeville Tornado

Max Winds 175 mph

Duration: 8 mins

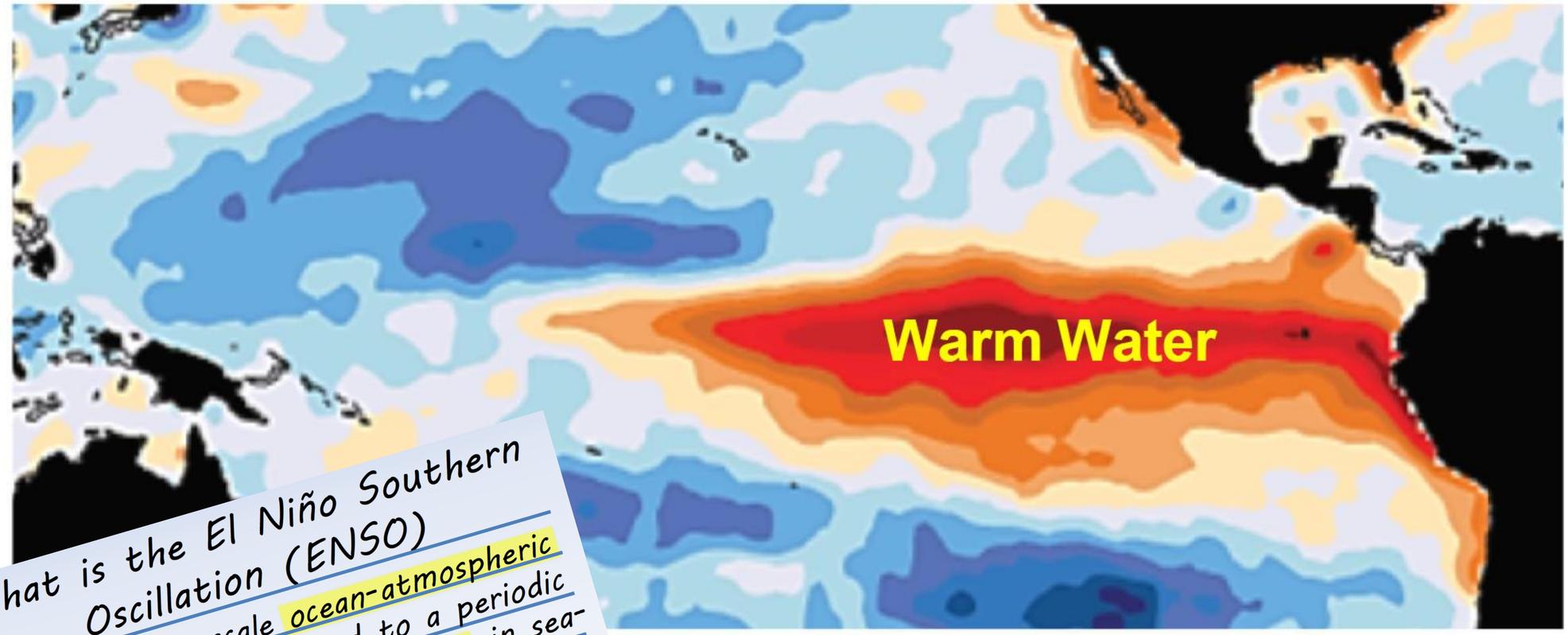
Pop Quiz!

TRUE or FALSE

Wind is the only hazard considered in storm “category”.

Seasonal Forecasting & Data Collection

What is El Nino?

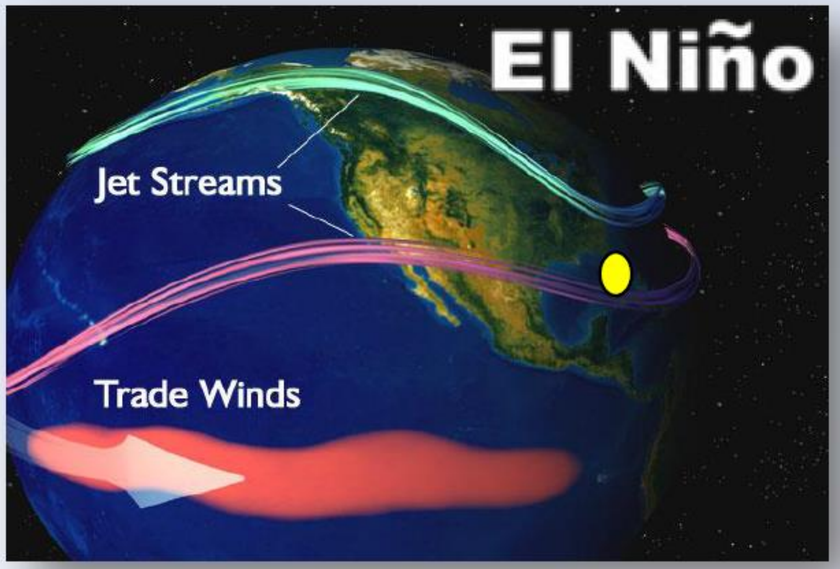


What is the El Niño Southern Oscillation (ENSO)

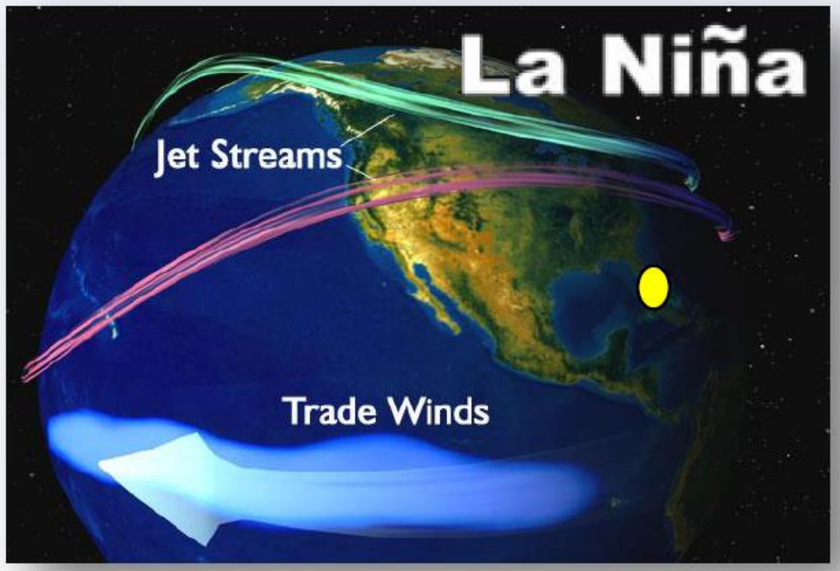
ENSO is a large-scale ocean-atmospheric climate phenomenon linked to a periodic (2 - 7 years) warming or cooling in sea-surface temperatures across the equatorial Pacific.

Only <u>ONE</u> of the large-scale oscillations, but very influential

The Cycle of El Nino/La Nina

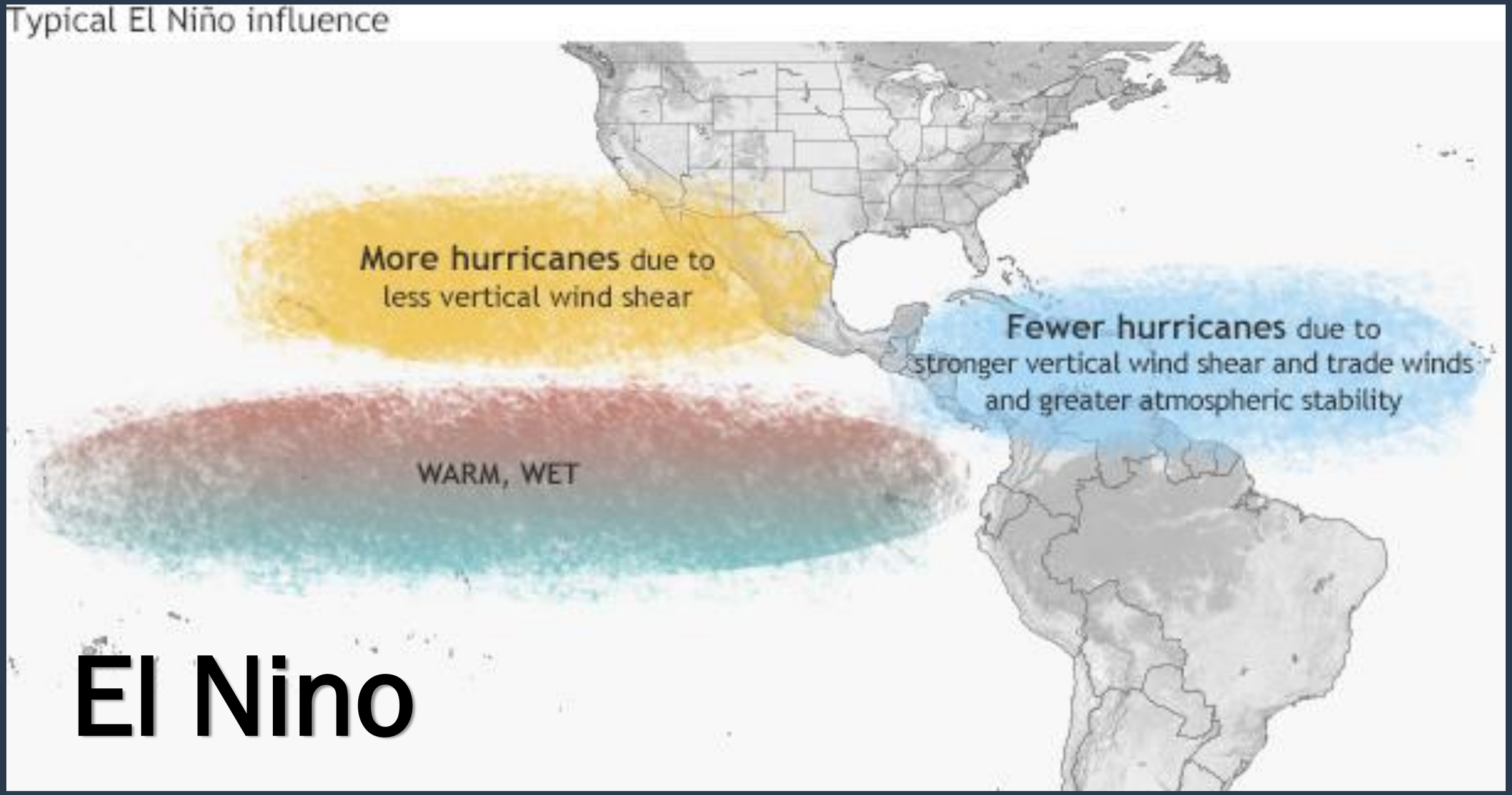


Jet stream positioned across the Gulf of Mexico and Southeast U.S. with **more active weather.**



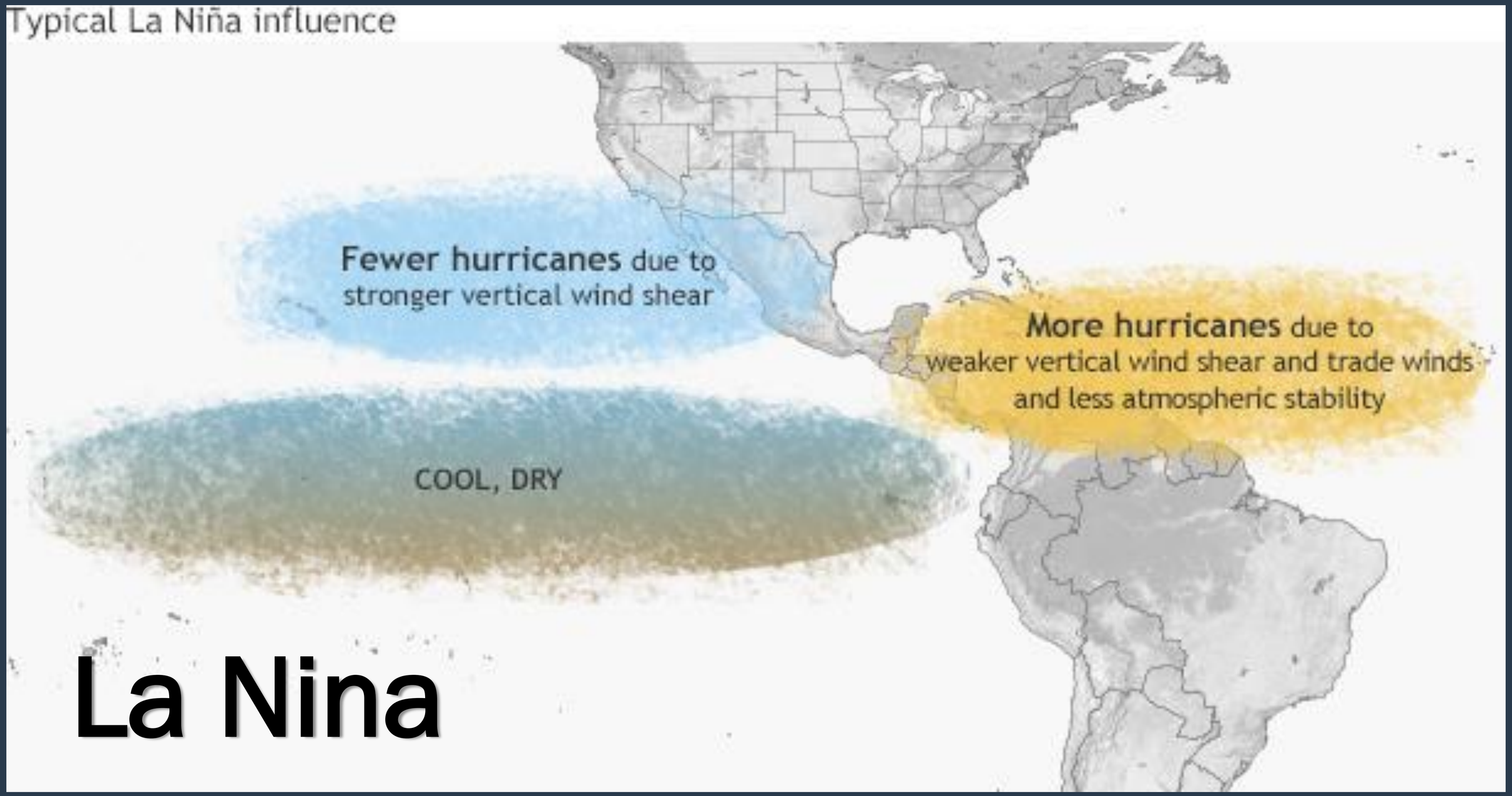
Jet stream positioned north of the Gulf with less active weather.

Influence on Tropical Activity



El Nino

Influence on Tropical Activity



La Nina

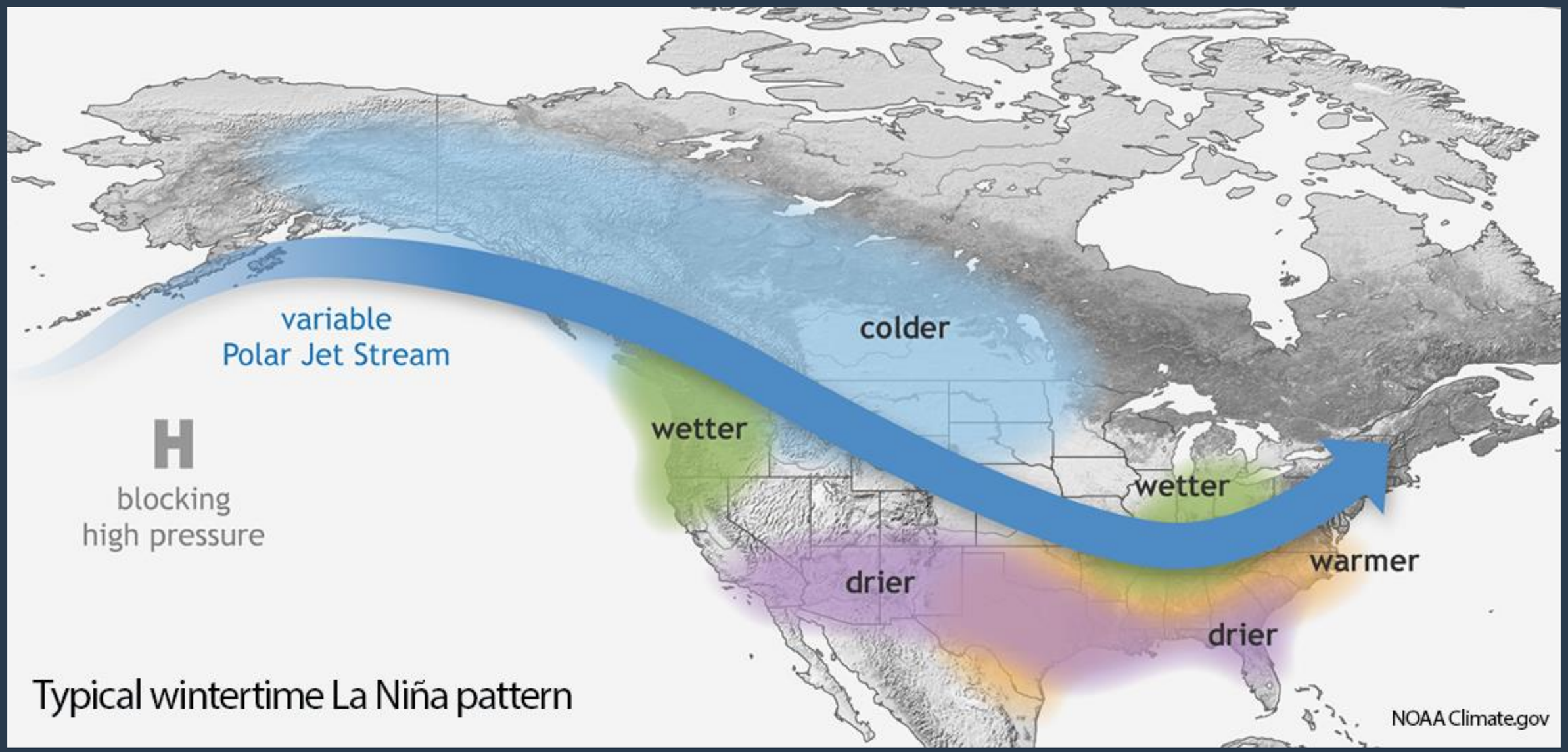
Fall 2020

La Nina develops during peak hurricane season

See how this natural phenomenon in the Equatorial Pacific could influence weather to come

Weather Climate | El Nino, La Nina, ENSO

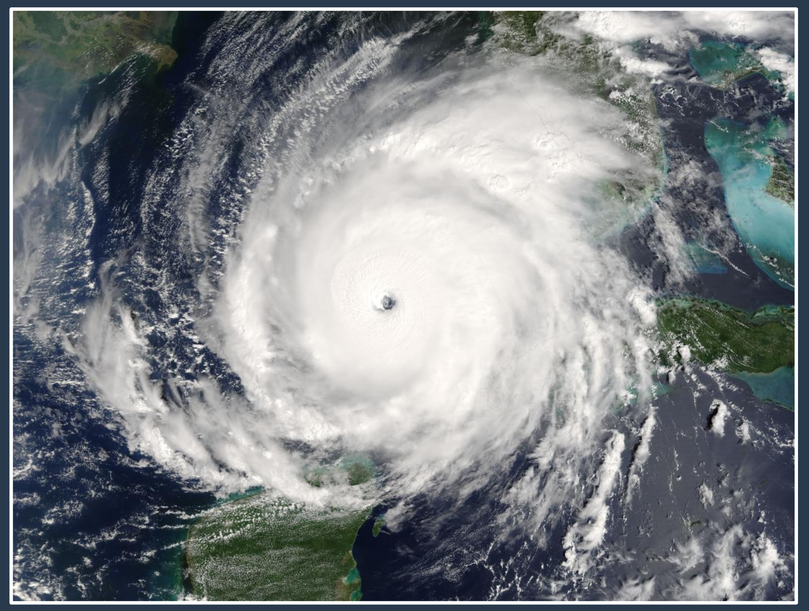
SHARE



Seasonal Forecasting

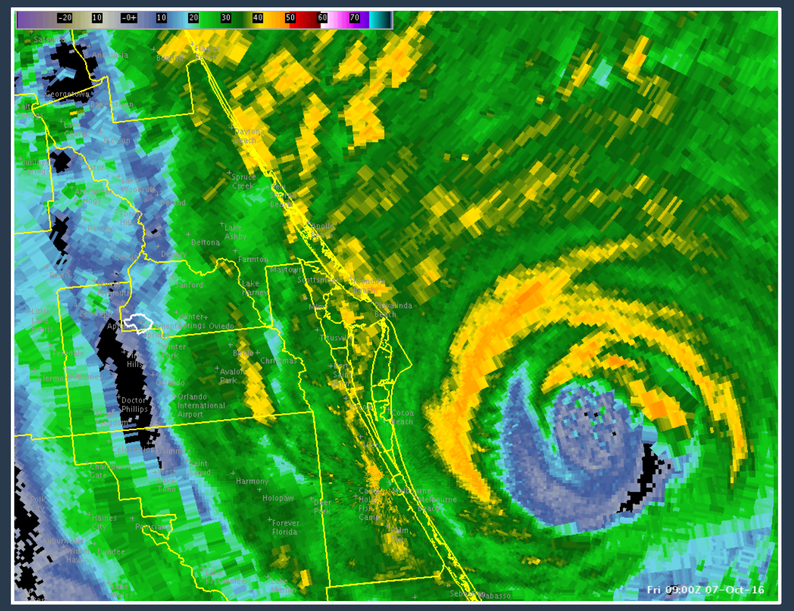
- Another way to measure total seasonal activity is by examining the Accumulated Cyclone Energy (ACE) index.
- The ACE index accounts for the combined intensity and duration of all named storms and hurricanes during the season.
- This outlook indicates the likelihood of an ACE ranging between **148 and 244**.
- 111+ is considered an above normal season; 152+ is considered extremely active.
- **2020 ACE: 182.2**
- For comparison, the ACE for 2019 was 132. The ACE for the 2004 season was 227, and 250 for the 2005 season.

Monitoring Tropical Cyclones



GOES Satellites (Space)

Hurricane Hunters (Air)



Doppler Radar (Ground)

National Hurricane Center and Weather Forecast Office Products

National Hurricane Center Products

Home | Mobile Site | Text Version | RSS | Local Forecast: Enter City,St or ZIP code | Go

NATIONAL HURRICANE CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

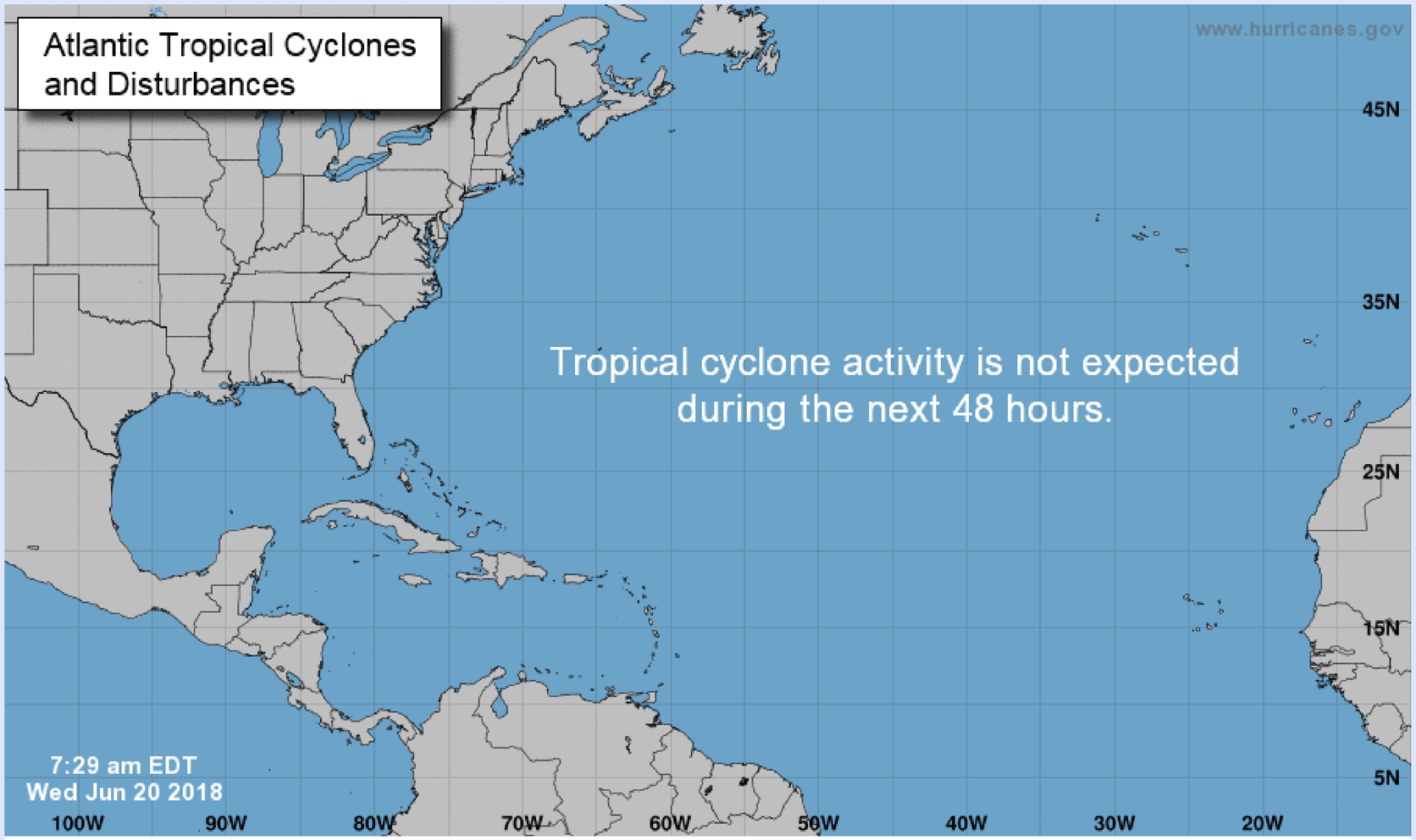
ANALYSES & FORECASTS | DATA & TOOLS | EDUCATIONAL RESOURCES | ARCHIVES | ABOUT NHC | SEARCH

Top News of the Day... *view past news*

Last update Wed, 20 Jun 2018 16:46:38 UTC

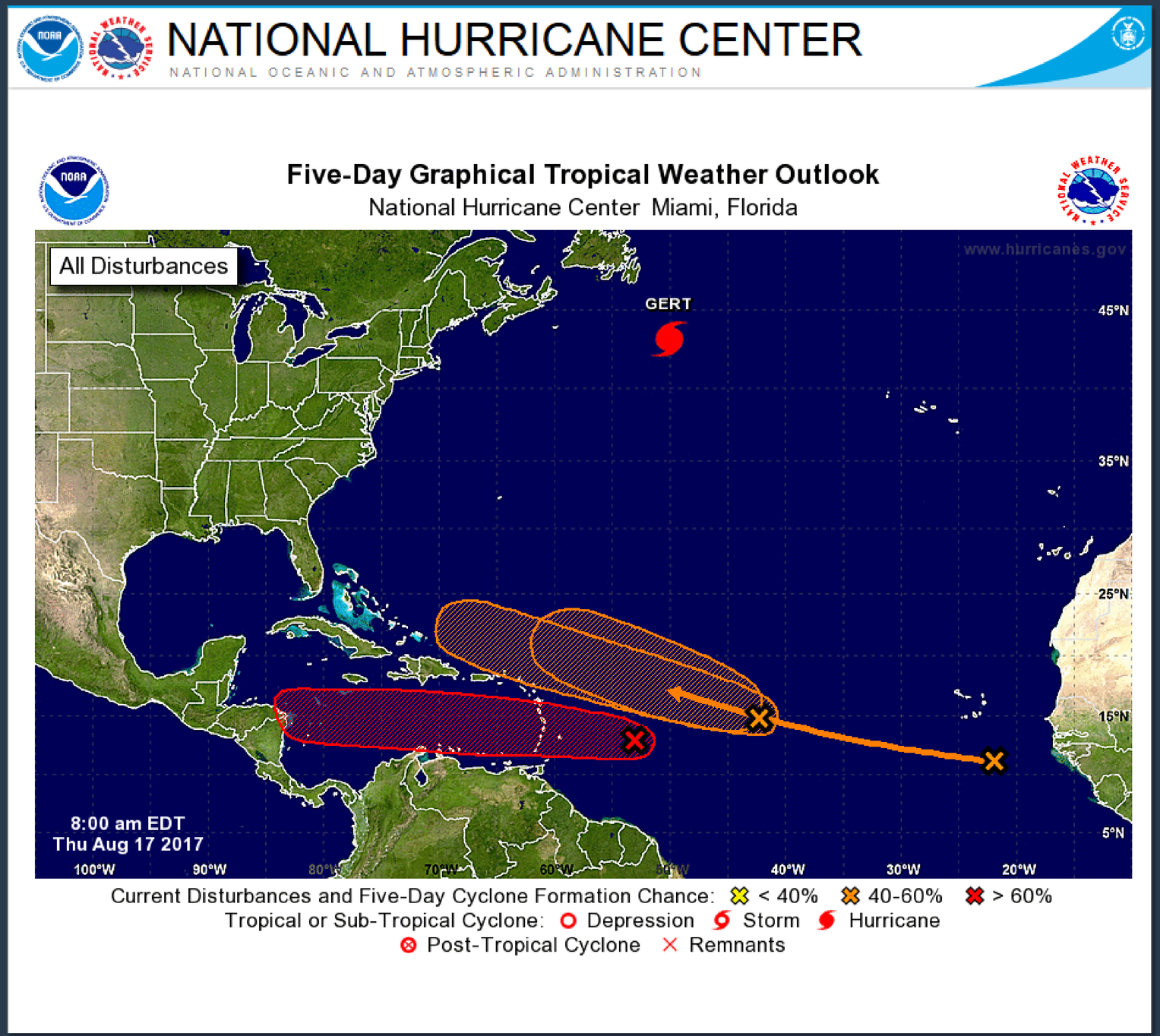
- Ken Graham discusses his new position as NHC Director
- FEMA Blog: Preparing Emergency Managers for Hurricane Season at NHC

Eastern North Pacific | **Atlantic**

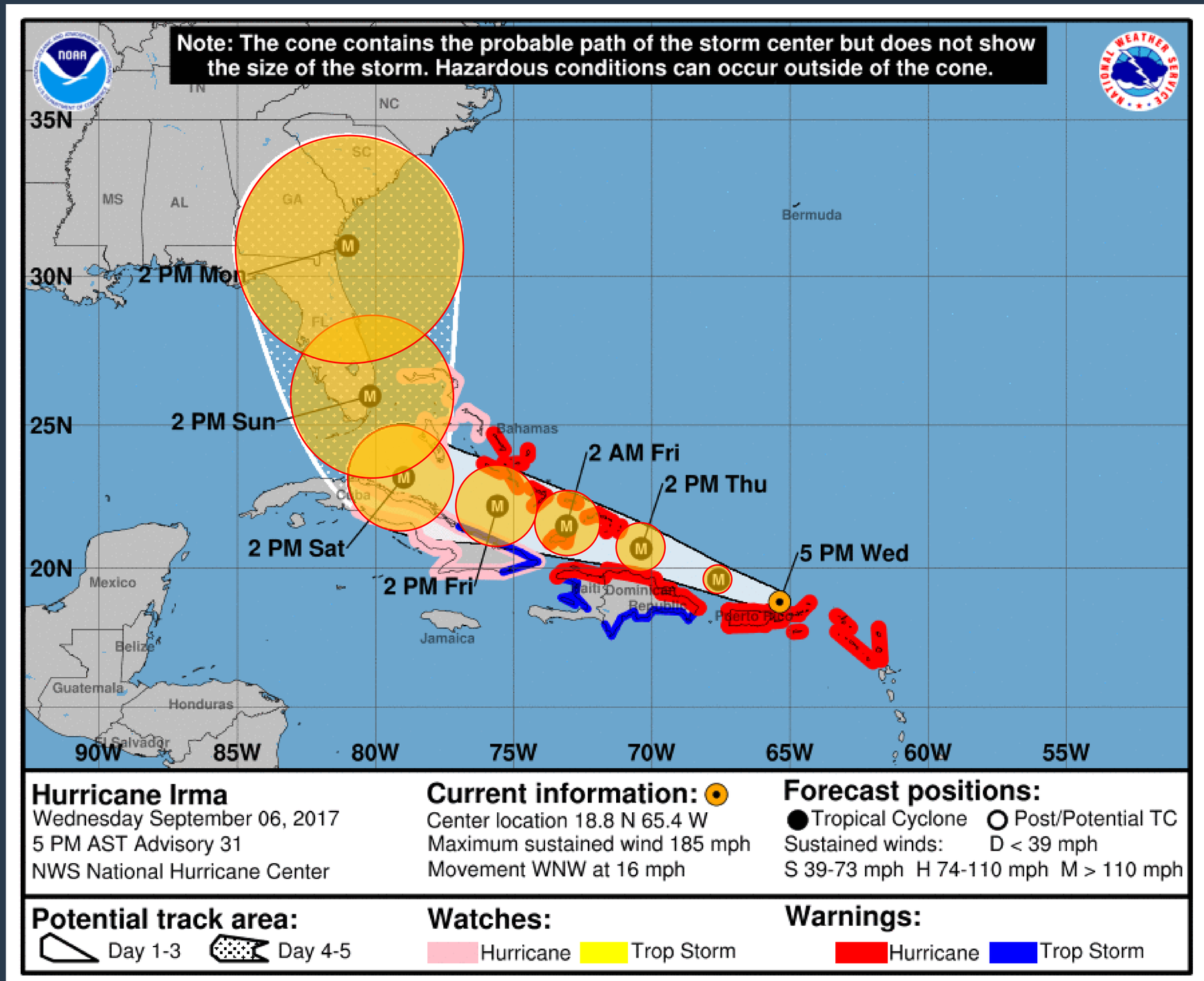


https://www.hurricanes.gov

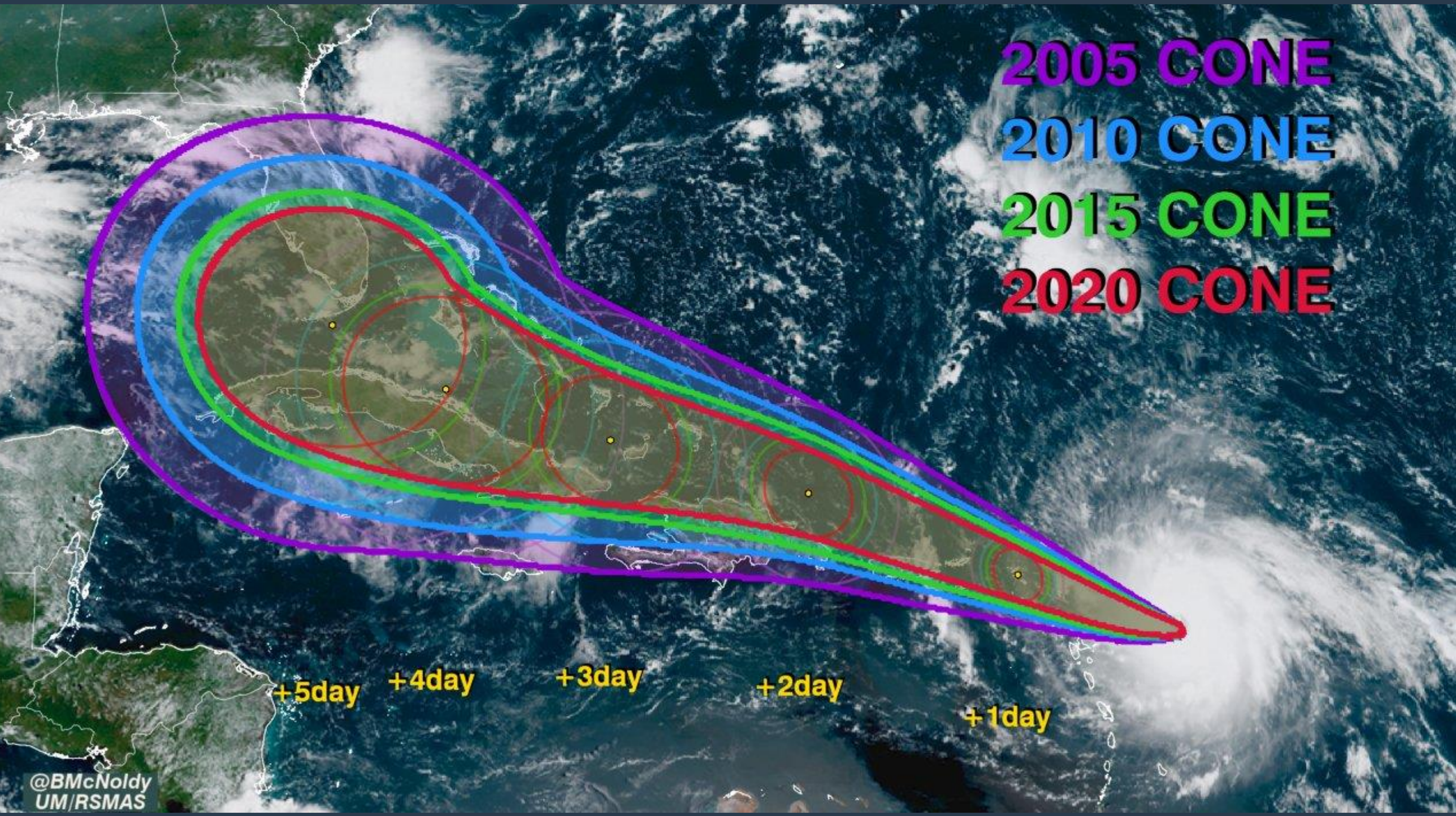
National Hurricane Center Products



National Hurricane Center Products



National Hurricane Center Products



Bottom Line

- Hurricane season runs through late November, but peaks from mid August through late September
- Tropical cyclones are not single points and capable of producing significant impacts regardless of their size or strength
- Stay informed through reliable sources and avoid the hype: understand the limits of hurricane forecasting!
- National Hurricane Center products will focus on the "big picture" while your local forecast office identifies potential impacts

NEXT CLASS

Tuesday, April 13 | 7 PM CDT

SATELLITES

Multiple people watching today's class from one screen?

LET US KNOW!

jessica.r.smith@noaa.gov

QUESTIONS?

JESSIE SMITH | METEOROLOGIST
National Weather Service – Melbourne, FL
Jessica.r.smith@noaa.gov